

A report on the anticipated acquisition by BT Group plc of EE Limited

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Terms of reference and conduct of the inquiry

Terms of reference

1. In exercise of its duty under section 33(1) of the Enterprise Act 2002 (**the Act**) the Competition and Markets Authority (**CMA**) believes that it is or may be the case that:
 - (a) arrangements are in progress or in contemplation which, if carried into effect, will result in the creation of a relevant merger situation in that:
 - (i) enterprises carried on by, or under the control of, BT Group plc will cease to be distinct from enterprises currently carried on by, or under the control of, EE Limited; and
 - (ii) section 23(1)(b) of the Act is satisfied; and
 - (b) the creation of that situation may be expected to result in a substantial lessening of competition within a market or markets in the United Kingdom (**the UK**) for goods or services, including the supply of:
 - (i) wholesale access and call origination services to mobile virtual network operators; and
 - (ii) fibre mobile backhaul services to mobile network operators.
2. Therefore, in exercise of its duty under section 33(1) of the Act, the CMA hereby makes a reference to its chair for the constitution of a group under Schedule 4 of the Enterprise and Regulatory Reform Act 2013 in order that the group may investigate and report on the following questions in accordance with section 36(1) of the Act:
 - (a) whether arrangements are in progress or in contemplation which, if carried into effect, will result in the creation of a relevant merger situation; and
 - (b) if so, whether the creation of that situation may be expected to result in a substantial lessening of competition within any market or markets in the UK for goods or services.

Andrea Coscelli
Executive Director, Markets and Mergers
Competition and Markets Authority
9 June 2015

Conduct of our inquiry

3. We published [biographies](#) on the members of the inquiry group on 19 June 2015. The [administrative timetable](#) for the inquiry was published on the case page on 30 June 2015.
4. We invited various third parties to comment on the merger and received 19 initial submissions from third parties. We also sent detailed questionnaires to competitors, customers and participants in the telecommunications market. In addition, we gathered oral evidence through undertaking hearings with selected third parties. Further evidence from third parties was obtained through telephone contact and additional written requests. Evidence provided to the CMA during phase 1 was also considered in phase 2. Non-confidential versions of the [summaries of hearings](#) with third parties were published on the case page. In response to publication of hearing summaries, we received three submissions providing additional comment.
5. Members of the inquiry group, accompanied by staff, visited BT's head office, BT's radio access network site at Baynard House and BT's communication exchange at Faraday Building in London. They were also given presentations at these sites.
6. On 17 July 2015, we published an [issues statement](#) on the case page, setting out the main areas of concern upon which the inquiry would focus. We invited the main parties and third parties to comment on this and received nine submissions in response.
7. We received written evidence from BT and EE, which provided non-confidential [main submissions](#). These submissions were published on the case page on 15 July 2015. We also held hearings with BT and EE on 18 August 2015 and 20 August 2015 respectively.
8. In the course of our inquiry we sent to BT, EE and other parties some working papers and/or extracts from those papers for comment including non-confidential extracts of the analysis prepared by Compass Lexecon for BT.
9. Our provisional findings were announced on 28 October 2015 and a non-confidential version of the [provisional findings report](#) was placed on the case page on 30 October 2015. We invited interested parties to comment on this and received 18 submissions in response (including 15 from third parties and two from members of the public).
10. We also announced an eight-week extension to the inquiry timetable to allow sufficient time to take full and proper account of submissions and the results of our investigation.

11. Two members disagreed with our provisional finding that the merger would be unlikely to result in an SLC in relation to the wholesale mobile market. We undertook further analysis, which is reflected in Chapter 14 of our final report, and also sought additional information from third parties. Based on a further assessment of all evidence and submissions in the round, all members were satisfied that an SLC in this market would not arise in relation to the provision of wholesale mobile services. The group's decision was therefore unanimous in finding no SLC in relation to the wholesale mobile market or any of the markets reviewed.
12. After considering the responses to our provisional findings, we announced our final decision on 15 January 2016, and a non-confidential version of the final report was placed on the [case page](#).
13. We would like to thank all those who have assisted in our inquiry.

Industry background

Introduction

1. This appendix covers background information on the telecoms industry and is structured as follows:
 - (a) A brief overview of significant historic developments in the industry.
 - (b) A discussion of telecoms industry metrics and industry trends.
 - (c) The fixed telecoms network infrastructure and suppliers.
 - (d) The mobile telecoms network infrastructure and suppliers.

Significant historic developments in the UK telecoms industry

2. This section provides an overview of significant historic developments in the UK telecoms industry.

Fixed-line sector

3. Significant industry developments include the following:
 - (a) EE fixed broadband launched (1998).¹
 - (b) BT launched broadband (2002).
 - (c) Virgin Mobile merged with NTL:Telewest (2006) and was rebranded (2007) to form Virgin Media.²
 - (d) EE fixed voice launched (2007).³
 - (e) BT announced £1.5 billion superfast broadband roll-out (2008).
 - (f) Virgin began upgrading network to 50 Mbit/s (2009).
 - (g) Vodafone purchased Cable & Wireless Worldwide plc (CWW), (2012).⁴

¹ Ofcom CMR (2015), p292. EE's fixed broadband service was launched by its predecessor company Freeserve.

² See [Virgin Mobile UK / Virgin Media](#) webpage.

³ EE's fixed voice offer was launched by its predecessor company Orange.

⁴ See Vodafone press release (July 2012): [Vodafone's Recommended Offer for Cable & Wireless Worldwide](#).

- (h) Sky purchased Telefónica's (O2 and BE brand) consumer fixed telephony and consumer fixed broadband business (2013).⁵
- (i) Virgin Media purchased by Liberty Global (2013).⁶
- (j) Virgin Media announced (2013) and commenced network upgrade to 152 Mbit/s (2014).
- (k) Virgin Media sold its off-net residential broadband customer base to TalkTalk (2014).
- (l) Virgin announced a £3 billion expansion project (known as 'Project Lightning') to extend its fibre network to approximately 4 million additional premises over five years (2015).⁷
- (m) TalkTalk sold its off-net (non-LLU) residential broadband customer base to Fleur Telecom, part of Daisy Group (2015).

Mobile sector

- 4. Significant industry developments include the following:
 - (a) Virgin Mobile launched (1999).⁸
 - (b) 2.1GHz ('3G') spectrum auction (2000).⁹
 - (c) BT wireless renamed mmo2 and demerged from BT, subsequently renamed O2 plc (2001/02).
 - (d) H3G launched in UK (2003).
 - (e) Tesco Mobile launched (2003).¹⁰
 - (f) O2 purchased by Telefónica (2005).
 - (g) Network sharing agreement created between T-Mobile and H3G (2007).

⁵ See O2 press release (March 2013): [Sky to Acquire Telefónica UK's Broadband and Fixed-Line Telephony Business](#).

⁶ See Liberty Global press release (June 2013): [Liberty Global Completes Acquisition of Virgin Media](#).

⁷ See Virgin Media press release (February 2015): [Virgin Media and Liberty Global announce largest investment in UK's internet infrastructure for more than a decade](#).

⁸ Virgin Mobile MVNO launched as a joint venture between Virgin and T-Mobile. See [Virgin Mobile UK / Virgin Media](#) webpage.

⁹ Ofcom (July 2015), [Strategic Review of Digital Communications \(SRDC\)](#), paragraph 4.47.

¹⁰ Tesco Mobile is a 50:50 joint venture between Tesco and Telefónica.

- (h) Passive network sharing agreements created between Vodafone and O2 (2008 and 2009).¹¹
- (i) Orange and T-Mobile merged to form Everything Everywhere (2010),¹² which was later rebranded as EE (2012).
- (j) TalkTalk mobile offer launched (2010).
- (k) EE 4G launched after Ofcom approved EE's application to 'reform' existing 1800 MHz spectrum to deliver 4G services (October 2012).¹³
- (l) Active network sharing (Beacon) agreements created between Vodafone and O2 (2012).¹⁴
- (m) 800MHz and 2.6GHz ('4G') spectrum auction completed (2013).¹⁵
- (n) O2's 4G licence included requirement to offer coverage to 98% of the UK population (when indoors) by 2017 at the latest (2013).¹⁶
- (o) Mobile by Sainsbury's launched (2013).¹⁷
- (p) O2 launched 4G services (August 2013).
- (q) Vodafone launched 4G services (August 2013).
- (r) H3G launched 4G services in London (December 2013).
- (s) H3G national roll-out of 4G services (March 2014).
- (t) Sky announced plans to launch a mobile service with O2 (January 2015).¹⁸
- (u) Dixons Carphone launched its 'iD' MVNO offer hosted by H3G (May 2015).¹⁹

¹¹ These agreements were terminated and replaced by the Beacon agreements in 2012.

¹² France Telecom and Deutsche Telekom committed that by 30 September 2013 at the latest 2x10 MHz of 1800MHz spectrum would be cleared and available for use by someone other than EE, and that by 30 September 2015 a further 2x5 MHz of 1800MHz spectrum would be similarly cleared and made available to the same party.

¹³ [EE initial submission](#), paragraph 2.

¹⁴ See Vodafone press release (June 2012): [Telefónica UK and Vodafone UK to Strengthen their Network Collaboration](#).

¹⁵ Ofcom announcement [Winners of the 4G mobile auction](#).

¹⁶ [Ofcom announcement](#), Note 2.

¹⁷ See Sainsbury's press release (July 2013): [Sainsbury's launches Mobile by Sainsbury's](#).

¹⁸ See Sky press release (January 2015): [Sky announces plans to enter mobile sector](#).

¹⁹ See Dixons Carphone press release (January 2015): [An excellent year with pro forma Headline profit before tax up 21%](#), p4.

- (v) Post Office launches MVNO on the EE network (June 2015).²⁰
- (w) Sainsbury's announced that Mobile by Sainsbury's will not operate after January 2016 (October 2015).²¹

Technology/service developments

- 5. Significant industry developments include the launches of the following:
 - (a) BBC iPlayer (2007).
 - (b) iPhone (2007); iPad (2010) and subsequent upgrades.
 - (c) On-demand film including Lovefilm (now Amazon Prime) (2010), Netflix (2012), Now TV and YouView (2012).

Regulatory developments

- 6. Significant regulatory developments include the following:
 - (a) Openreach established as a functionally separate entity from BT (2005).
 - (b) Retail fixed voice market deregulated (2009).^{22,23}
 - (c) Regulated access for BT to Sky Sports 1 and 2 (2010).²⁴
 - (d) Access to BT ducts for next generation build (2010).
 - (e) Revised consumer switching process introduced on fixed line copper led by the provider gaining the customer, known as gaining provider led switching (GPL) (2013).²⁵
 - (f) New minimum quality of service standards imposed on Openreach (2014).
 - (g) 90% geographic coverage obligation on mobile network operators in relation to voice services by 2017 (agreed in 2014, imposed in 2015).

²⁰ See news article (June 2015), [Post Office enters mobile market](#).

²¹ See Sainsbury's [announcement](#).

²² Ofcom (April 2015), [Review of fixed call origination and termination markets 2016-19](#), paragraph 1.10.

²³ In the 2013 Narrowband Statement, Ofcom explained that in the Hull area, although KCOM's market share remained high both in retail and residential and in retail business calls, it considered that *ex post* competition law was sufficient to address any competition concerns at the retail level. See Ofcom (April 2015), [Review of fixed call origination and termination markets 2016-19](#), paragraph 1.10 and footnote 5.

²⁴ [Ofcom SRDC](#) (2015), paragraph 1.6. We note that this is subject to legal dispute.

²⁵ See Ofcom press release (August 2013): [Consumers to benefit from easier broadband and landline switching](#).

- (h) Ofcom announced its decision to delay commencing the PSSR auction process until after the Commission has taken its decision regarding the proposed H3G/O2 merger (December 2015).²⁶

Industry metrics and market developments

7. This section sets out revenue and volume metrics for the UK telecoms market, examines recent changes in rates of growth and prices, and provides more detail on market developments (see Section 5 for key industry trends).

Telecoms revenue and volume metrics

8. Ofcom collects data quarterly from telecom operators which is published in its quarterly Telecoms Data Updates and in its annual CMR.^{27,28} The 2015 CMR indicates that total UK telecoms revenues declined in 2014, falling by £0.8 billion (2%) to £37.4 billion.²⁹ The fall in overall telecoms revenue in 2014 was the result of declining revenues in the three areas of wholesale services, retail mobile and corporate data services, with growth in retail fixed revenues³⁰ insufficient to offset these reductions.³¹

Declining wholesale services, retail mobile and corporate data services revenue

9. The fall in wholesale service revenue of £0.8 billion (11.5%) during the year was largely due to falling mobile call termination revenue. Total retail mobile revenue fell in 2014, down by £0.2 billion (-1.5%) to £15.3 billion mainly as a result of falling use of out-of bundle calls and messaging.³² Corporate data services revenue (that is, spend on services that connect businesses to each other, and web hosting) fell 1% to £2.6 billion.³³

Increasing retail fixed revenue

10. The rise in total retail fixed revenue, which increased year-on-year by £0.8 billion (3.2%) to £13.3 billion,³⁴ was driven by higher fixed internet revenues. Retail residential and SME fixed internet revenues rose strongly compared

²⁶ See Ofcom website [Public Sector Spectrum Release](#).

²⁷ [Ofcom Telecoms Data Updates](#)

²⁸ [Ofcom CMR \(2015\)](#)

²⁹ [Ofcom CMR \(2015\)](#) p255.

³⁰ Including fixed access and call revenues and fixed internet revenue.

³¹ Within total retail fixed revenue there was a decline in fixed access and call revenue.

³² [Ofcom CMR \(2015\)](#), p292.

³³ [Ofcom CMR \(2015\)](#), p301. Revenue related to connectivity only, excluding revenue related to managed services.

³⁴ [Ofcom CMR \(2015\)](#), Figure 4.27.

with 2013 as a result of increasing SFBB take-up. This increase was more than sufficient to offset a decline of £0.2 billion in fixed voice revenues.

11. Fixed voice revenue continued to decline in 2014 due to falling traditional fixed telephony call volumes. Call volumes from fixed lines fell by 12.6% in 2014, a higher rate of decline than the 10.6% fall in 2013, suggesting that the rate at which consumers are substituting mobile calls and other forms of communication, such as email, IM and communication via social networking sites for fixed voice calls is increasing.³⁵ We note that a shift towards line rental services that include bundled calls and broadband means that the distinction between fixed voice revenue and fixed broadband revenue in recent years may be less clear than was historically the case.

Retail mobile revenue

12. Within retail mobile revenue there was a marked difference in the rates of change of constituent elements with 2014 revenue from mobile data growing at 3.1% year-on-year, which helped to offset a 28.2% fall in revenue generated by out-of-bundle mobile messaging. During the period 2009 to 2014, revenue from mobile data grew at a CAGR of 11.7%.
13. Table 1 shows retail mobile revenue by service.

Table 1: Retail mobile revenue by service

	<i>£bn</i>						<i>%</i>	
	2009	2010	2011	2012	2013	2014	2014 growth	5 year CAGR
Mobile data revenue (out of bundle)	1.6	1.8	2.1	2.5	2.7	2.7	3.1	11.7
Mobile messaging (out of bundle)	2.7	2.6	2.5	2.4	1.8	1.3	-28.2	-13.4
Mobile calls (out of bundle)	4.7	4.3	3.9	3.7	3.2	2.9	-9.7	-9.2
Mobile access & bundled services*	6.1	6.4	6.8	7.3	7.8	8.3	6.5	6.5
Retail mobile total	15.0	15.1	15.4	15.9	15.5	15.3	-1.5	0.3

Source: Ofcom CMR (2015), Figure 4.45.

Note: Totals may differ slightly due to rounding.

*Estimated narrowband revenue was £1.5 million in 2014.

14. Mobile access and bundled services revenue also increased in 2014 due to the migration of prepay customers onto post-pay services.³⁶ With a post-pay service the user pays a monthly fee for which they typically receive an allowance of bundled calls, messages and data, and any use outside these allowances is billed at the end of the month. With prepay services, the user

³⁵ Ofcom CMR (2015), p280.

³⁶ According to uSwitch, the definition of prepay and post-pay is 'Pay monthly/post-pay mobile phone tariffs allow you to make one monthly payment and usually include a set amount of minutes and texts. You will be invoiced for any talk time you use over the included amount. Pay as you go tariffs allow you to top-up your phone with credit in advance and then use your phone until that prepaid credit runs out. People who like to have complete control over what they are spending prefer to use pay as you go.'

buys credit in advance, and this is used to pay for any service use as it takes place.³⁷

15. The migration of prepay customers onto post-pay services can be partly attributed to increasing smartphone use. Smartphones can support post-pay services that enable users to spread the cost of a handset across the lifetime of the contract rather than having to pay this upfront.³⁸ We also note that the relative attractions of prepay and post-pay services can be affected by the level of handset subsidies. For example Ofcom has previously indicated that some mobile providers have made prepay services less attractive to consumers (by reducing handset subsidies and increasing prices) in order to migrate prepay users onto post-pay services (as post-pay customers typically have a higher lifetime value than prepay users due to higher average spend and lower rates of churn to other providers).³⁹
16. We note, however that the clear distinction between prepay and post-pay as consumer segment descriptors is changing as CPs billing systems evolve. Mobile tariffs have recently emerged that blur the distinction between prepay and post-pay services, such as prepay offers with top-up options that provide an allowance of calls, messages and data that expires after a month.⁴⁰ A further driver of changes to tariffs has been the launch of the Apple iPhone, which catalysed demand for post-pay type usage, but where the consumer owned their own phone, rather than it being supplied by the network on a subsidised basis. For some prepay users who wanted to access sophisticated services on smartphones, crossing over to become post-pay consumers was undesirable or too difficult. In response, a new tariff segment appears to be emerging, and post-pay and prepay are evolving such that their differences are becoming less distinct.
17. Figure 1 shows the contract length of post-pay plans and illustrates recent growth in shorter term contracts (when they are classified as post-pay).

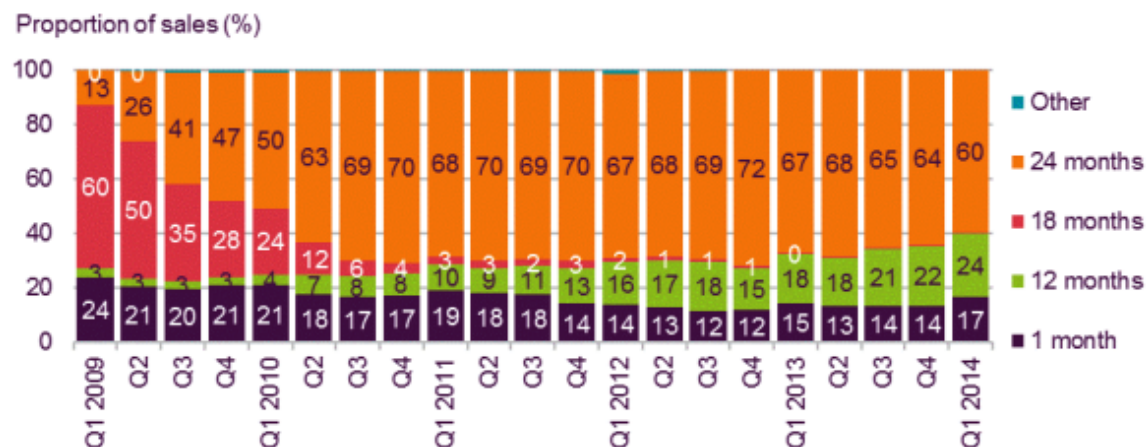
³⁷ Ofcom CMR (2014), p337.

³⁸ Ofcom CMR (2014), p325.

³⁹ Ofcom CMR (2014), p337.

⁴⁰ Ofcom CMR (2014), p337.

Figure 1: Contract lengths for new post-pay mobile connections



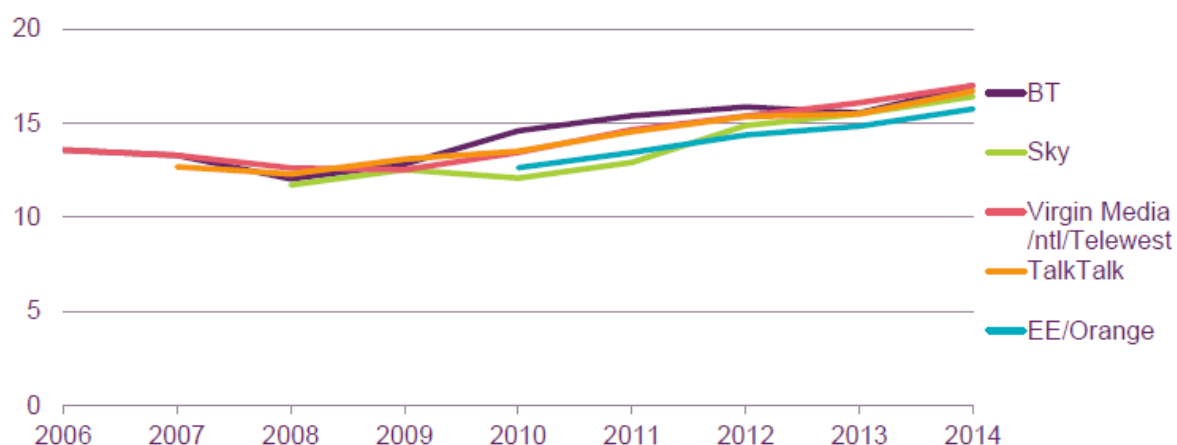
Source: Ofcom CMR (2014), Figure 5.75 – GfK Retail and Technology UK Ltd.
 Notes: England, Scotland and Wales only (excludes Northern Ireland); based on GfK’s coverage of 95% of the consumer market; based on new post-pay connections; excludes contract renewals; only represents sales through consumer channels (excluding Apple Store and eBay).

Price trends

Fixed voice prices

- Residential line rental charges have risen in recent years (see Figure 2). Across the major landline providers, the basic fixed line rental fee has risen by an average of over 25% in real terms since 2010. Ofcom notes that a key reason for basic line rental service price increases is likely to be falling landline call volumes (see above), and an increase in the bundling of calls with line rental packages, which has resulted in a significant erosion of call revenues.⁴¹

Figure 2: Residential line rental charges, £/month, December 2014 prices



Source: Ofcom CMR (2015), Figure 4.22.

⁴¹ Ofcom CMR (2015), p274.

Fixed broadband prices

19. Although the average price of a residential fixed broadband package has fallen by 40% in real terms between 2004 and the end of 2014,⁴² the trend more recently indicates that service providers have increased prices as consumers have migrated onto superfast broadband connections. The average monthly price of a fixed broadband line increased by 9.6% in 2014 to £18.86, which represents the greatest increase in price in the last four years.⁴³ Ofcom research also shows, however, that the average actual download speed of a UK residential fixed broadband line has risen significantly during this period. Average speeds increased by 28.1% from 17.8 Mbit/s in November 2013 to 22.8 Mbit/s in November 2014.⁴⁴
20. Trends in retail mobile prices are shown below at paragraph 24.

Mobile connections

21. At the end of 2014 there was a total of 89.9 million active mobile connections comprising handsets, dedicated mobile data connections⁴⁵ and M2M connections.⁴⁶ The number of mobile handset connections increased by 702,000 (0.9%) to 78.5 million, reversing the 0.4% fall seen in 2013 (see Section 2 Table 2.1).
22. Ofcom took the view in the CMR (2014) that the growth in smartphone take-up in 2013 was likely to be the key factor behind the falls in mobile handset connections and mobile broadband connections. Increasing smartphone take-up means that more consumers can access data services on the move (and in some cases use their handset's data connection on a PC/laptop/tablet computer via tethering) which reduces the need for a separate mobile broadband service. High handset prices for many smartphones (and mobile providers making prepay services less attractive to consumers) mean that consumers are less likely to have more than one handset subscription for personal use. Nevertheless, increasing take-up of mobile services by

⁴² Ofcom SRDC (2015), paragraph 1.3. Includes VAT, expressed in 2014 prices.

⁴³ Ofcom CMR (2015), p313.

⁴⁴ Ofcom CMR (2015), Figure 4.71

⁴⁵ Ofcom define mobile broadband as access to a mobile data network via a USB stick or dongle, or built-in connectivity in a laptop/netbook/tablet with a SIM, tethering (via mobile phone internet connection on a laptop/tablet), and MiFi mobile broadband wireless router. See Ofcom CMR (2015), p268.

⁴⁶ Total active mobile subscriptions include active mobile handset, dedicated mobile data subscriptions such as mobile broadband dongles and data-only SIMs, and machine to machine (M2M) connections. Ofcom's definition of M2M refers to generally to a connection, often wireless, in which human input is not necessarily required. It includes uses such as smart electricity meters (where the meter reports energy usage back to a central billing database), a burglar alarm, which may contain a SIM card to enable communication with monitoring offices. Vending machines are another common example of, as some may use M2M technology to keep a central computer up-to-date with stock levels. See Ofcom CMR (2015), p295.

businesses will have an upward effect on the number of people using more than one mobile device).⁴⁷ We note that the CMR 2015 does not provide commentary on the change in trend in 2014.

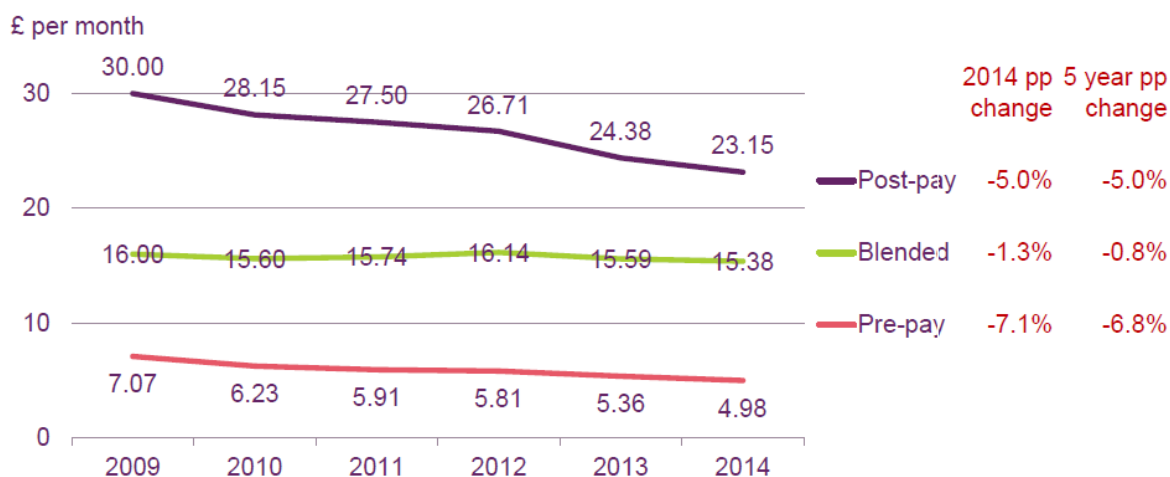
4G subscribers

23. During 2014, total 4G mobile subscriber numbers increased from 2.7 million to 23.6 million, taking the proportion of total mobile subscriptions (including M2M)⁴⁸ that were 4G to 28% in Q4 2014.⁴⁹

Retail mobile price trends

24. Average monthly retail revenue per mobile subscription fell by 1.3% to £15.38 in 2014 (see Figure 3). This reflected falling average revenues per user for both post-pay and prepay subscriptions in the year.

Figure 3: Average monthly retail revenue per mobile subscription



Source: Ofcom CMR (2015), Figure 4.46.

Notes:

1. 'Blended' refers to the average across all subscriptions. Mobile voice revenues include revenues from bundled messaging and data services.
2. pp indicates the change over the relevant period in percentage terms (not percentage points).

25. Along with falling prices and declining SMS use, a key reason for falling average revenues among prepay and post-pay users is the migration of higher-use prepay users onto post-pay services during the year (see

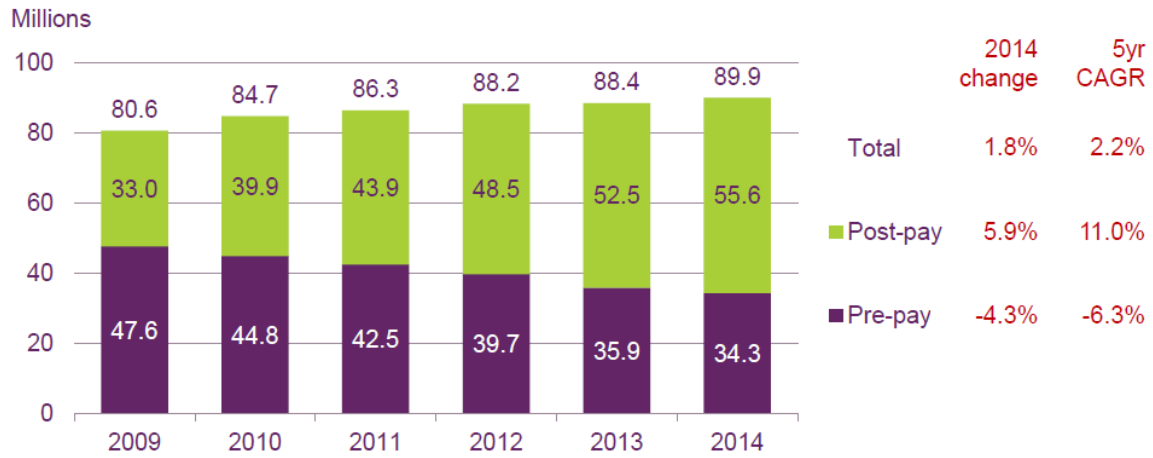
⁴⁷ Ofcom CMR (2014), p336.

⁴⁸ Ofcom figures indicate that at the end of 2014 there were 89.9 million mobile subscriptions including 6.3 million M2M connections. See Section 2, Table 2.1 for active handset figures.

⁴⁹ Ofcom CMR (2015), paragraph 4.1.2 and Figure 4.2. Includes all consumers (business and residential) whose tariff allows them to access 4G mobile services, even those without a 4G-enabled device or in areas where their provider has no 4G coverage.

Figure 4), although as discussed earlier, the prepay/post-pay distinction is less clear than it was.

Figure 4: Mobile subscriptions, by prepay and post-pay

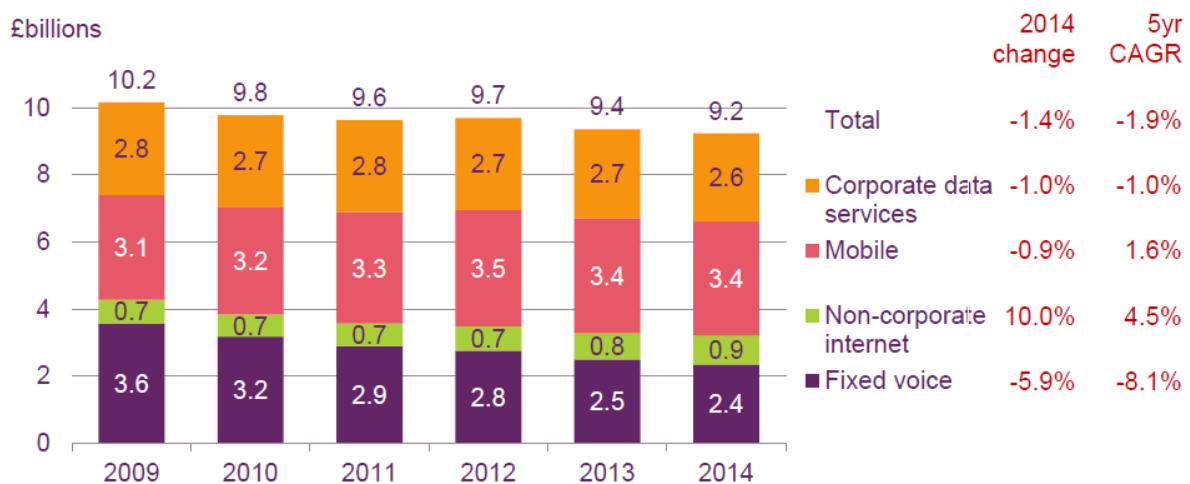


Source: Ofcom CMR (2015), Figure 4.50.
 Note: Includes M2M connections.

Business telecoms

26. Total UK telecoms revenue from businesses generated £9.2 billion in 2014, including £2.4 billion from fixed voice and £3.4 billion from mobile services (see Figure 5). Overall business retail telecoms revenues accounted for 29.7% of total UK retail telecoms revenue in 2014, a 0.6 percentage point decrease since 2013.⁵⁰

Figure 5: Retail business telecoms revenue, by service



Source: Ofcom CMR (2015), Figure 4.52.

⁵⁰ Ofcom CMR (2015), p297.

Fixed business telecoms

27. At the end of 2014 there was a total of 7.7 million business fixed lines and ISDN channels;⁵¹ a fall of 0.6 million (7.2%) year on year and 2.4 million (23.7%) fewer than there had been at the end of 2009. Falling numbers of traditional fixed lines among business are mainly due to increasing use of mobile voice and data and IP telephony services, which are not fully allocated in Ofcom data.⁵²

Mobile business telecoms

28. The proportion of business calls that originated on mobile networks was 57% in 2014, up from 52.7% in 2013, which was the first year in which more than half of business call volumes were made from mobile phones. Business mobile call volumes increased during 2014 by 5.2% to 24.8 billion minutes.⁵³
29. As shown in Table 2, at the end of 2014 there was a total of 11.6 million business mobile connections (comprising 9.7 million voice subscriptions and 1.9 million dedicated mobile broadband connections, but excluding M2M connections), equivalent to 14% of total mobile connections.

Table 2: Business mobile and dedicated mobile broadband connections, 2014

	<i>Business</i>	<i>Residential</i>	<i>Total</i>	<i>%</i> <i>Business connections</i> <i>as percentage of</i> <i>total connections</i>
Connections including voice	9.7	68.7	78.4	12.4
Dedicated mobile broadband connections	1.9	3.3	5.3	35.8
Total connections	11.6	72.0	83.7	13.9

Source: Ofcom/operators. See [Ofcom CMR \(2015\)](#), Figure 4.57 and Figure 4.1.

30. In its SRDC discussion document 2015, Ofcom noted that Virgin Media, TalkTalk and BT have re-launched their SME propositions and new technologies have facilitated entry from alternative network business-focused providers such as Metronet, Optimity and Warwicknet. In addition, Ofcom notes that there are also new opportunities for small local resellers created by increasing demand for bundled connectivity, applications and IT support.⁵⁴

⁵¹ ISDN is a standard developed to cover a range of voice, data, and image services intended to provide end-to-end, simultaneous handling of voice and data on a single link and network.

⁵² [Ofcom CMR \(2015\)](#), p299.

⁵³ [Ofcom CMR \(2015\)](#), p298 and Figure 4.53.

⁵⁴ [Ofcom SRDC \(2015\)](#), paragraph 4.33.

Industry developments

31. Section 5 discusses the key industry trends which are most relevant to our competitive assessment. We include below some further detail on: (i) demand for data; (ii) triple-play and quad-play services; (iii) over the top (OTT) services; and (iv) network developments.

Demand for data

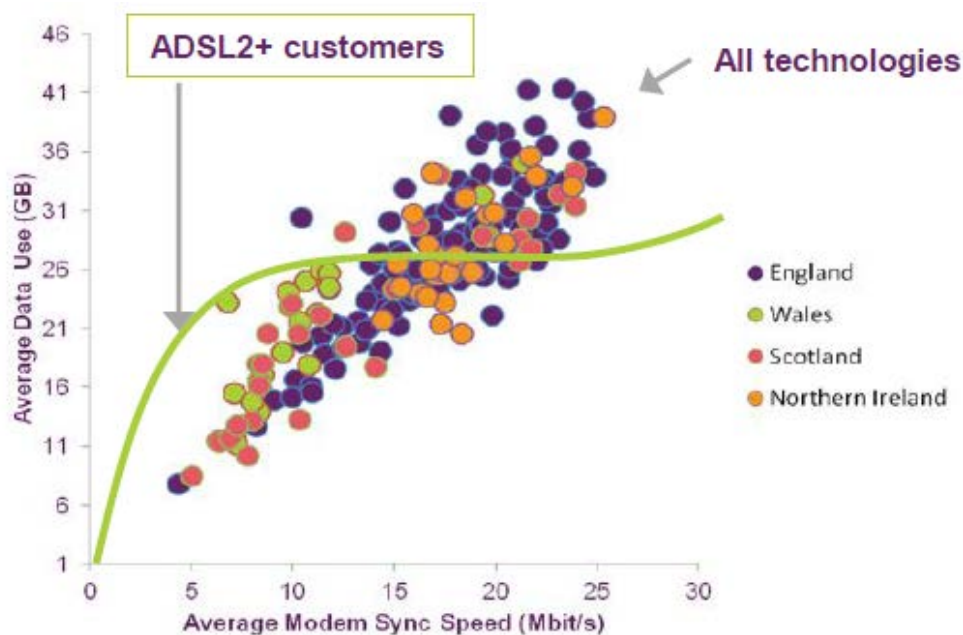
32. Figure 6 shows that as broadband data speeds grow, so does data usage. Clearly, the likely level of future data download speeds and demand is unknown, but there is general agreement among industry participants that demand for data will increase, subject to factors which may limit demand growth such as the affordability of data and the geographic coverage/capacity of networks. This implies that network capacity and speed are likely to become increasingly important factors in the competitive dynamic between MNOs and fixed communications providers.
33. It is Ofcom's view that substantial growth in future demand for data is likely to need a new wave of investment in the fixed telecoms sector to deliver ultrafast broadband services (see below). In mobile, Ofcom considers that more investment will probably be needed in 4G and, ultimately, a transition to 5G, potentially in around 2020.⁵⁵

Demand for fixed data

34. Figure 6, which is based on work by IRU in 2013, suggests that for all broadband technologies as the average speed of broadband data access increases the average volume of data use rises. In the case of ADSL2+ customers, where access uses copper connections, the rate of increase in data use is limited once usage reaches around 10 Mbit/s, which reflects the lower transmission capability of this older technology (see the subsection below on broadband speeds for further details).

⁵⁵ Ofcom SRDC (2015), paragraphs 1.9 and 4.77.

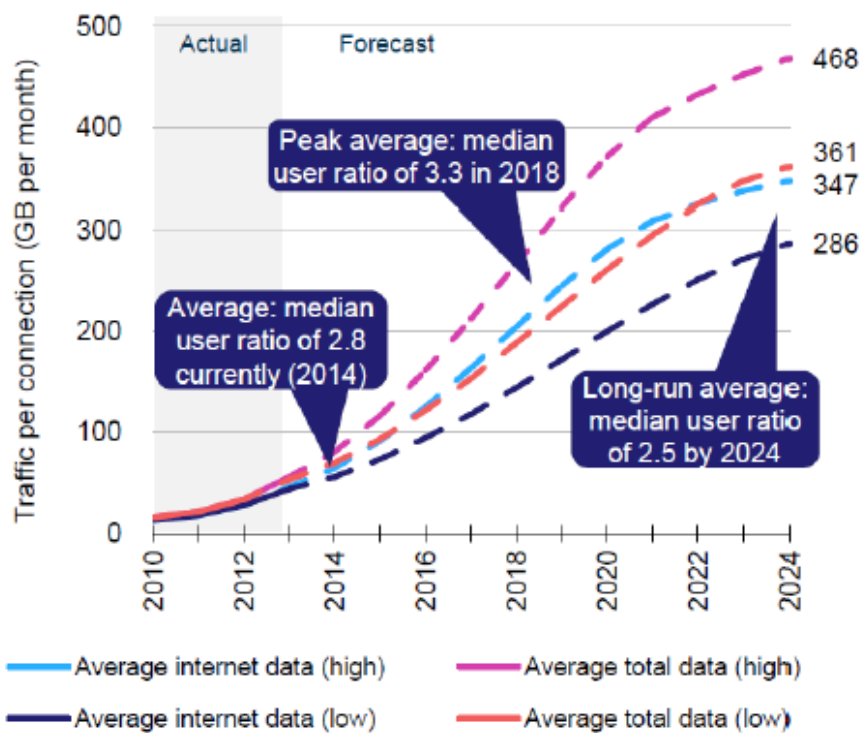
Figure 6: Data use vs. average broadband speed, 2013



Source: Ofcom.

35. Analysys Mason forecasts indicate that by 2024 the average traffic per broadband connection could reach a high of 468 GB per month (see Figure 7).

Figure 7: Traffic forecasts per broadband connection, 2010-24



Source: Analysys Mason 2014 – see Ofcom SRDC presentation (11 May 2015).

Demand for mobile data

36. In recent years there has been a significant increase in the amount of mobile data downloaded and uploaded. Overall data usage has increased from 28.9 million GB in June 2013 to 44.3 million GB in June 2014 (a 53% increase),⁵⁶ and the data throughput per active connection has increased from 0.35 GB per active SIM to 0.53 GB per active SIM.⁵⁷

Patterns of fixed and mobile data usage

37. Although the percentage of growth in mobile data is large, absolute levels of use are still much lower than for fixed broadband. Ofcom figures for 2014 indicate that mobile users used an average of 0.5 GB of data per month, compared with an average of 58 GB over fixed broadband connections.⁵⁸

Triple-play and quad-play services

38. There have been several waves of increased bundling, starting with voice and broadband services being delivered over the same connection (dual-play); followed by the addition of TV content (triple-play); and with mobile increasingly being added to retail offers (quad-play).
39. In the UK there are several operators providing triple-play offers, which include fixed voice, broadband and TV services, including BT, Virgin Media, Sky, TalkTalk and EE. It is possible for consumers to source the four services of fixed voice, broadband, TV and mobile in a quad-play offer from Virgin Media, TalkTalk, EE and BT. TalkTalk,⁵⁹ offers quad-play via a single subscription. In addition, Sky is planning to add a mobile service to its current triple-play offer in 2016 via its MVNO agreement with O2,⁶⁰ and press reports have suggested that Vodafone is planning to launch its pay TV offering before the end of this calendar year.⁶¹ Vodafone told us that it is planning to launch its pay TV offering [X].

⁵⁶ [Ofcom Infrastructure Report 2014](#), paragraph 1.47.

⁵⁷ [Ofcom Infrastructure Report 2014](#), paragraph 5.96.

⁵⁸ [Ofcom Infrastructure Report 2014](#), paragraph 1.48.

⁵⁹ TalkTalk told us that its PlusTV contract comes with a free SIM under the same contract.

⁶⁰ See Sky press release (January 2015): [Sky announces plans to enter mobile sector](#).

⁶¹ *The Guardian* (May 2015), [Vodafone prepares to launch its home broadband and pay TV offerings](#).

Suppliers and their bundles

40. We consider below the main suppliers of bundled retail services (approximately in order of decreasing scale taking into account both triple-play and quad-play offers).

- *Virgin Media*

41. Virgin Media's first bundles comprising fixed telephony, broadband, TV and mobile were launched in September 2006.⁶² Virgin Media had 17.1% of its UK customers subscribing to its four services during the three months ended 30 June 2015.^{63,64} As part of its TV service, Virgin is able to offer access to Sky Sports 1 and 2 as part of its bundled offers (see paragraph 51).⁶⁵

- *Sky*

42. Sky is a significant triple-play provider with almost 40% of its customer base taking the three services of fixed telephony, broadband⁶⁶ and TV as at January 2015.⁶⁷ As noted above, Sky plans to launch its first mobile telephony services to customers in 2016 and is targeting a customer base of [X].

- *TalkTalk*

43. TalkTalk's approach to bundled offers stems from the scale of its broadband base (18% of subscribers, the number four to BT, Sky, and Virgin)⁶⁸ and the breadth of its network infrastructure given its presence in over 3,000 unbundled BT exchanges.⁶⁹ Of TalkTalk's broadband customer base, [X]% of customers take a triple-play offer including fixed voice, broadband and TV; just over [X]% take triple-play including fixed voice, broadband and mobile, and [X]% take a full quad-play service. In TV, TalkTalk offers access to Sky Sports 1 and 2 as part of its bundled offers,⁷⁰ [X].

⁶² BBC News (September 2006), [NTL launches quadruple-play deal](#).

⁶³ See Liberty Global press release (August 2015): [Q2 2015 Fixed Income Release](#), p3.

⁶⁴ Virgin Media defines quad-play penetration as the number of customers who subscribe to Virgin Media's four primary services: video, internet, fixed-line telephony, and post-pay or prepay mobile telephony, divided by customer relationships. See Liberty Global press release (May 2015): [Q1 2015 Fixed Income Release](#), p36.

⁶⁵ Virgin Media also offers access to Sky Sports 3, 4 and 5, together with the F1 channel.

⁶⁶ Sky launched broadband in 2007 and has since grown organically and via the purchase of Telefónica's customer base in 2013. See Sky press release (January 2015): [Sky announces plans to enter mobile sector](#).

⁶⁷ See Sky press release (January 2015): [Sky announces plans to enter mobile sector](#).

⁶⁸ Ofcom SRDC (2015), p292.

⁶⁹ See TalkTalk (May 2015), [Preliminary results for the 12 months to 31 March 2015 \(FY15\)](#), section 5.

⁷⁰ See the [TalkTalk Plus TV](#) webpage.

44. In mobile TalkTalk is in the process of transitioning its customers onto the O2 network from Vodafone. TalkTalk has announced that this will allow it to offer 4G services, fully integrated quad-play and deliver much improved economics compared with its current arrangement with Vodafone, under which it provides mobile primarily as an add-on.⁷¹ TalkTalk has announced that over the next two years it expects its economics will improve further as it integrates the core network it is constructing with that of O2, thereby building its own mobile asset.⁷² In addition, TalkTalk plans to begin deploying femtocells (through a router upgrade programme) which will allow it to offload mobile traffic onto its fixed network via its in-home 4G network, thereby delivering a superior in-home voice experience.⁷³ TalkTalk told us that in addition to delivering a superior in-home voice experience, its offload onto femtocells is designed to improve superior voice performance outside the home in densely built areas for both voice and data by removing localised ‘not spots’.
45. In fibre, TalkTalk has announced that it is testing expansion through a joint venture with Sky and CityFibre in York based on a build cost of under £500 per premise passed and take-up of 30 to 40% based on the joint venture’s combined market share. The company predicts that it will be possible to roll out this FTTP trial in scale and build a network accessible to approximately 10 million households across the UK.⁷⁴
- *Vodafone*
46. In 2012 Vodafone purchased CWW, an operator primarily serving large business customers and public bodies. Part of the rationale for the combination of Vodafone and CWW was to create an integrated fixed and mobile operator.⁷⁵ At the time of purchase, CWW provided access through a combination of fibre, digital microwave radio and leased circuits, and in 2012 had one of the largest fibre networks in the UK comprising around 20,500 km in length configured primarily as a national backbone network.⁷⁶ The legacy CWW fibre network now provides some of Vodafone’s backhaul for mobile data traffic in a small number of locations. As indicated above, Vodafone

⁷¹ As at March 2015, TalkTalk had 464,000 mobile subscribers See TalkTalk (May 2015), [Preliminary results for the 12 months to 31 March 2015 \(FY15\)](#), p10.

⁷² See TalkTalk (May 2015), [Preliminary results for the 12 months to 31 March 2015 \(FY15\)](#), p10.

⁷³ See TalkTalk (May 2015), [Preliminary results for the 12 months to 31 March 2015 \(FY15\)](#), p10.

⁷⁴ See TalkTalk (May 2015), [Preliminary results for the 12 months to 31 March 2015 \(FY15\)](#), p10.

⁷⁵ Vodafone stated that the combination of Vodafone Group and CWW will create a leading enterprise-focused operator in the UK that will be well positioned to capitalise on the growing market for unified communications and offer UK enterprise customers the opportunity to purchase advanced total communications services from a single service provider. See Vodafone (April 2012), [Recommended cash offer for Cable & Wireless Worldwide PLC by Vodafone Europe B.V.](#), p9.

⁷⁶ See Vodafone (April 2012), [Recommended cash offer for Cable & Wireless Worldwide PLC by Vodafone Europe B.V.](#), p11.

recently launched fixed broadband/voice services and plans to launch a pay TV service [X].

- *EE*

47. EE offers all four services of voice, broadband, TV and mobile, although it has a small presence in broadband and very limited presence in TV (less than [X]% of total UK TV subscribers). EE's TV platform was launched in late 2014 and the service is offered to existing and new EE broadband customers (who also take an EE/Orange/T-Mobile mobile service) for £3 a month. The service consists of a Freeview set-top box with some additional features, such as catch-up and on-demand services and OTT pay services such as Now TV and Wuaki.^{77, 78}

- *BT*

48. Following the launch of BT's consumer mobile service in 2015, BT offers all four services of voice, broadband, TV and mobile. In addition to BT's own BT Sports offer, following regulatory intervention (see paragraph 53) BT also offers access to Sky Sports 1 and 2 as part of its bundled offers. BT's entry into wholesale TV channel provision with the launch of BT Sport has relied on upselling to a related subscriber base (broadband subscribers) over which some of the costs of sports rights investment can be recovered.

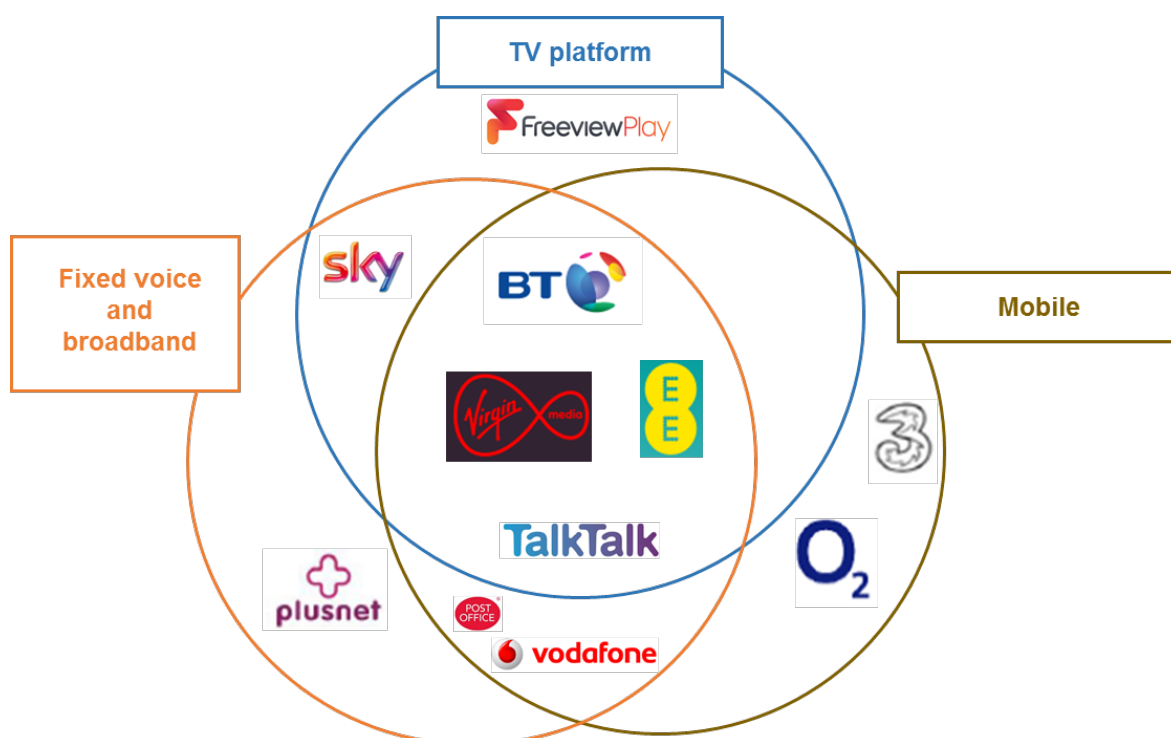
- *Other providers of bundled services*

49. In addition to the main operators discussed above, a number of other CPs offer bundled services including Plusnet (which is part of BT), and the Post Office.
50. Figure 8 illustrates the nature of services of the main operators in the fixed-mobile bundling segment.

⁷⁷ Wuaki.tv is part of the Rakuten Group e-commerce company.

⁷⁸ See the [EE](#) webpages.

Figure 8: Stylised illustration of consumer fixed-mobile bundle providers



Source: CMA.

The role of pay TV in bundles

51. The traditional pay TV business model has typically involved offering large bundles of content. These are now increasingly bundled together with telecoms services. Both Sky and BT are vertically-integrated providers, active both in the broadcasting of channels as well as the retailing of pay TV services. Virgin Media and TalkTalk acquire wholesale content services in order to retail these to their customers. New pay TV services, such as Netflix and Amazon Prime Instant Video, have emerged using OTT delivery.⁷⁹
52. Ofcom notes evidence that, for many consumers, TV content is the most important part of their bundle. So if a retail provider cannot offer attractive content, this is likely to reduce competition across all services in the bundle.⁸⁰
53. In its Pay TV Investigation in 2010, Ofcom found that premium sports content was key content for pay TV services and concluded that Sky should be required to offer Sky Sports 1 and 2 to competing retailers by imposing a wholesale must-offer (WMO) remedy – essentially an access-based model of competition for this type of content. Sky currently supplies these channels to Virgin Media and TalkTalk on commercial terms, but it currently provides

⁷⁹ Ofcom SRDC (2015), paragraph 9.95.

⁸⁰ Ofcom SRDC (2015), paragraph 1.61.

Sky Sports 1 and 2 to BT's YouView platform on regulated terms. In December 2015 Ofcom announced that following a review it had decided to remove the WMO obligation from Sky.⁸¹

54. BT estimates the split for pay TV providers as shown in Table 3.

Table 3: Pay TV operators

Provider	Share of subscribers
Sky	[X]
Virgin Media	[X]
TalkTalk	[X]
BT	[X]

Source: BT, based on Company results; 3 Reasons LLP; Enders Analysis; M&CI Team Estimates.

Switching and contract terms in bundled offers

55. Ofcom recently announced that it is reviewing the switching processes for triple-play bundles noting that bundling creates a new set of challenges that could affect the consumer experience and dampen competitive pressure.⁸² Ofcom cites research that found that of the consumers who have switched at least one of their communications services, only 8% switched three services at the same time.⁸³

56. Ofcom has also noted that bundling may make contract terms harder for consumers to navigate. For example, it can be confusing for a consumer who is thinking about switching, at the point when one of their services is due for renewal, to discover that other services are still in contract for a number of months. Alongside work on switching processes, Ofcom has said that it may need to consider non-process barriers to engagement and switching such as contractual terms in its SRDC.⁸⁴

Over the top services

57. The third trend we consider below is that of the increasing presence of OTT services. The transition in messaging to OTT operators such as WhatsApp can be seen in the decline in the total volume of SMS and MMS messages, which in the UK are down from a peak of 151 billion in 2012 to 110 billion in 2014.⁸⁵ Associated revenues have dropped from £2.7 billion in 2009 to

⁸¹ See Ofcom website: [Review of the pay TV wholesale must-offer obligation](#).

⁸² Ofcom SRDC (2015), paragraph 1.75.

⁸³ Ofcom (2014), *Ofcom Switching Tracker 2014*, Table 255.

⁸⁴ Ofcom SRDC (2015), paragraph 1.76.

⁸⁵ Ofcom CMR (2015), Figure 4.48.

£1.3 billion.⁸⁶ WhatsApp was founded in 2009 and carried more than 50 billion messages per day in January 2014, equivalent to 120% more than the estimated total volume of text messages globally.⁸⁷ In March 2015, WhatsApp announced that it was adding VoIP to its messaging app.⁸⁸ Since its launch in the UK in 2012, Netflix has increased subscriptions to 4.4 million households, and Amazon Prime Instant Video (formerly LoveFilm) has attracted 1.2 million subscribers.⁸⁹

Network developments

58. The fourth trend we consider below is that of the Internet of Things (IoT) comprising applications and services based on applications and devices communicating with each other without human involvement. Existing examples include home management sensors, smart meters, vehicle traffic management and wearable technologies such as fitness bands. Ofcom noted in its Infrastructure Report 2014 that while connectivity demands for bandwidth would generally be low for the IoT, reliability, privacy, ubiquity and other performance needs might not be met by existing access technologies and networks, and it is possible that the IoT will ultimately require dedicated networks.⁹⁰
59. BT told us [🔒].⁹¹ We note, however, that at present the copper network is used for testing lines and the need to retain testing functionality is likely to be relevant in this context.

Fixed network infrastructure and suppliers

Fixed network providers

60. Figure 9 shows a simplified and stylised configuration of the fixed network infrastructure for the main operators described above.

⁸⁶ Ofcom CMR (2015), Figure 4.45.

⁸⁷ Strategy Eye (January 2014), [WhatsApp surpasses global SMS volume](#).

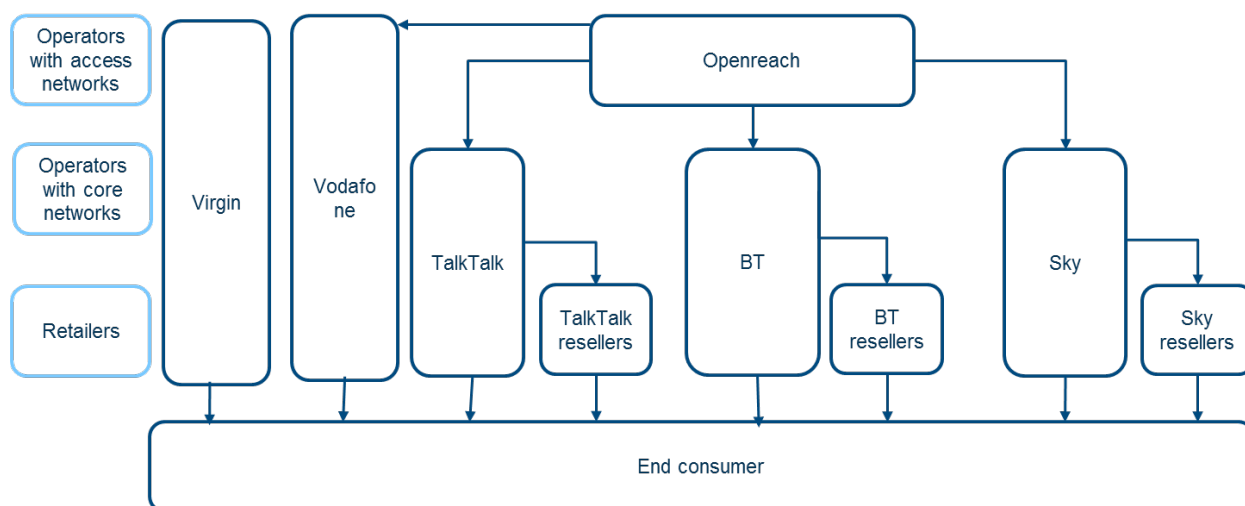
⁸⁸ *The Guardian* (February 2014), [WhatsApp adding voice calls is a logical move](#).

⁸⁹ Ofcom SRDC (2015), paragraph 4.7; and BARB *Establishment Survey*, Q1 2015.

⁹⁰ Ofcom Infrastructure Report (2014), paragraph 1.51.

⁹¹ Fixed lines based on circuit-switched fixed telephone lines are also known as PSTN lines.

Figure 9: Stylised fixed network diagram



Source: CMA.

Local loop unbundling

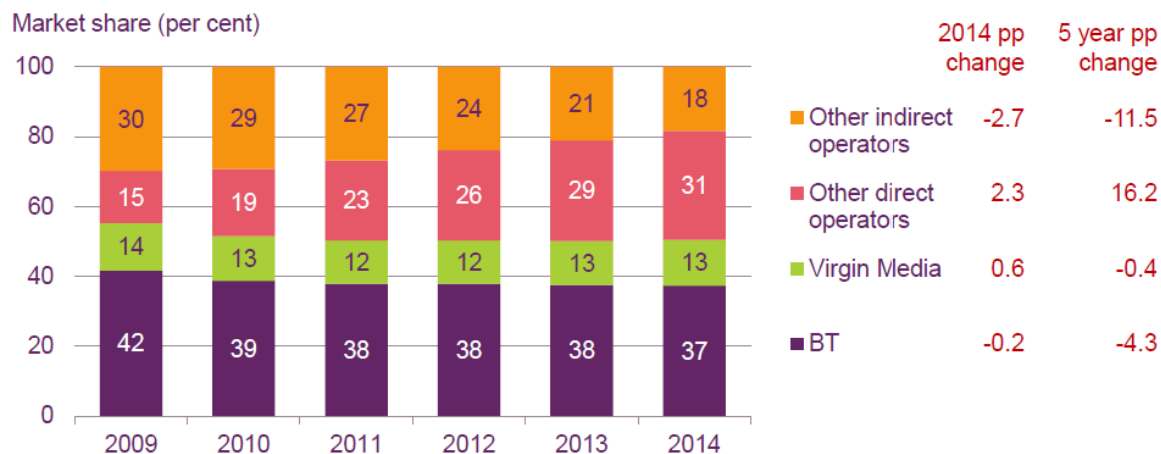
61. Local loop unbundling has been key to the development of the UK fixed voice and broadband markets over the past decade and, by the end of 2013 27.7% of the UK's 33.4 million fixed lines were provided using LLU, an 11.6 percentage point increase compared with 2008. At the end of 2013 95.1% of UK premises were connected to an unbundled BT local exchange, a level of coverage made possible by unbundling 57% of BT's local exchanges (of which there are around 5,600).⁹²

Fixed voice

62. BT's share of retail fixed voice call volumes has declined in the last five years from 42% in 2009 to 37% at the end of 2014 (see Figure 10). This change has been driven by the successful roll-out of local loop unbundling (see above).

⁹² Ofcom CMR (2014), p327.

Figure 10: Retail fixed voice call volumes, 2009 to 2014



Source: Ofcom CMR (2015), Figure 4.36.

Note: pp indicates percentage point.

63. Table 4 shows the fixed operators' share of retail call volumes. EE launched its fixed voice offer in 2007 and according to its estimates had a [X] % share of fixed call volumes in March 2015.⁹³ In addition to the above operators, Vodafone launched its consumer fixed voice service on 10 June 2015 in selected areas (see paragraph 71).⁹⁴

Table 4: Fixed voice operators' share of retail call volumes, 2014⁹⁵

%	
Share	
[X]	[X]
[X]	[X]
[X]	[X]
[X]	[X]
[X]	[X]
[X]	[X]
[X]	[X]

Source: Ofcom.

Fixed broadband

64. The proportion of broadband connections based on 'next generation' connections (excluding Virgin Media) increased from 10.3% to 15.4% in the year to December 2014.⁹⁶

⁹³ EE's fixed voice offer was launched by its predecessor company Orange.

⁹⁴ See Vodafone press release (June 2015): ['Vodafone Connect' broadband and home phone services now available to Vodafone UK customers.](#)

⁹⁵ Includes residential and all business.

⁹⁶ Ofcom (April 2015), [Telecommunications Market Data Update Q4 2014](#). Next generation defined here as the proportion of broadband connections that were classified by Ofcom as being 'other inc. FTTx' (which are almost all fibre broadband connections).

Broadband speeds

65. Despite growth in superfast broadband provision, most UK broadband connections are still ‘current generation’. As at June 2014 the majority (59%) of connections in the UK were ADSL2 or ADSL2+, despite NGA coverage of 78% nationally.⁹⁷ Take-up of SFBB was 32% at the end of 2014, as shown in Table 5.
66. Ofcom estimates that a typical household needs a 10 Mbit/s speed to benefit from the most popular online services and that provision to 8% of households falls below this threshold.⁹⁸

Table 5: Broadband metrics

Type of broadband offer	Mbit/s	% of premises	
	Minimum download speed	Availability 2013	Take-up
Basic	2	97	
Standard	10	85	
Superfast	30	75*	32†
Ultrafast	approx. 100		
Total fixed broadband			78‡

Source: Ofcom and CMA.

*83 for May 2015.

†Ofcom SRDC (2015), relates to end of 2014.

‡Ofcom SRDC (2015), relates to Q1 2015.

67. The aim of the government’s ongoing broadband roll-out intervention programme (in conjunction with BDUK)⁹⁹ is to push broadband with speeds of over 24 Mbit/s to 95% of premises by 2017. It is also testing options to extend faster broadband coverage to the final 5%.¹⁰⁰
68. In recent months BT has announced that it would deliver speeds of up to 500 Mbit/s to most of the UK within a decade.¹⁰¹

Broadband upload speeds

69. Upload speeds can also be crucially important for some services. High quality video calling, for example, requires both fast download and fast upload speeds. The average upload speed in the UK in December 2014 was 3 Mbit/s, compared with an average download speed of 23 Mbit/s. For those

⁹⁷ Ofcom Infrastructure Report 2014, paragraph 3.83.

⁹⁸ Ofcom SRDC (2015), paragraph 1.17.

⁹⁹ Broadband Delivery UK (BDUK), part of the Department for Culture, Media and Sport, is delivering superfast broadband and better mobile connectivity to the UK.

¹⁰⁰ Ofcom Infrastructure Report 2014, paragraph 3.1 and Ofcom SRDC (2015), paragraph 1.1.

¹⁰¹ Ofcom SRDC (2015), paragraph 1.17.

premises with superfast broadband connections, the average upload speed was 8 Mbit/s compared with an average download speed of 56 Mbit/s.¹⁰²

Traffic management

70. The way that CPs use traffic management has a direct effect on the network performance delivered to users. Operators use traffic management to minimise the effects of network congestion and the profile of this issue has increased since the government published its policy on Net Neutrality.¹⁰³

Broadband operators

71. As shown in Table 6, BT is the largest operator in the fixed broadband sector with a share of subscribers of 32.3% as at Q3 2014, according to Analysys Mason. Sky's market position has been built by focusing on retailing a residential broadband offer with its core TV proposition and is the number two operator, with a share of subscribers around 10 percentage points lower than BT at 22.4%. Virgin Media is the number three operator with a 19.4% share of subscribers, closely followed by TalkTalk, which has grown by positioning itself as a provider of value-for-money services. EE, having launched its fixed broadband offer in 1998, had a 4% share of all fixed broadband subscribers in 2014.¹⁰⁴ In addition to the above, Vodafone launched its consumer fixed broadband service in selected areas in June 2015 based on download speeds of up to 76 Mbp/s.^{105,106} In August Vodafone moved to a full roll-out to the rest of Vodafone's UK mobile customer base.¹⁰⁷

¹⁰² [Ofcom Infrastructure Report 2014](#), paragraph 1.29.

¹⁰³ EE, Vodafone and Virgin Media have signed up to the Broadband Stakeholder Group (BSG) Open Internet Code of Practice.

¹⁰⁴ [Ofcom CMR](#) (2015), p292. EE's fixed broadband service was launched by its predecessor company Freeserve.

¹⁰⁵ Initially Manchester, Berkshire and parts of Hampshire and Surrey; followed by Essex, Hertfordshire and Yorkshire.

¹⁰⁶ See Vodafone press release (June 2015): ['Vodafone Connect' broadband and home phone services now available to Vodafone UK customers](#).

¹⁰⁷ See Vodafone press release (August 2015): [Millions of Vodafone customers across the UK now eligible for Vodafone broadband and home phone services](#).

Table 6: Fixed broadband operators' retail market share by subscribers

	%	
	<i>All fixed broadband</i>	<i>SFBB</i>
	Q3 2014*	Q1 2015†
BT retail	32.3	36
Sky	22.4	6
Virgin Media	19.4	49
TalkTalk	18.0	6
EE	3.4	1
Others	4.5	2

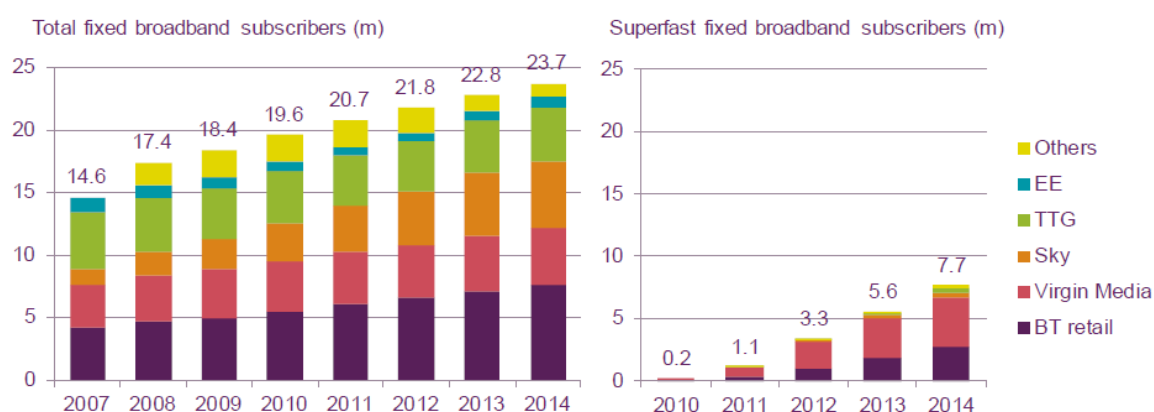
Source: Analysys Mason and Enders Analysis.

*Analysys Mason.

†Enders Analysis.

72. In SFBB, BT and Virgin Media are now focusing heavily on upgrading customers to their SFBB services. As a result, these two firms have an estimated 36% and 49% share of SFBB connections respectively, according to Enders Analysis' calculations. Other providers including Sky and TalkTalk have recently started active marketing of SFBB and account for an estimated 15% of connections.¹⁰⁸

Figure 11: Total and superfast fixed broadband subscribers, 2007 to 2014



Source: Enders Analysis, Q1 2015. Ofcom SRDC (2015), Figure 4.

Note: Data reflects company reported information where possible. However, estimates are used where data is incomplete or inconsistent.

73. Ofcom data indicates that in the SME fixed broadband sector: (a) BT Business remains the largest provider, with an approximately 49% share of SME fixed-line revenues; (b) no other provider has more than a 10% share; and (c) there is a long tail of smaller providers and resellers.¹⁰⁹

¹⁰⁸ Ofcom SRDC (2015), paragraph 4.25.

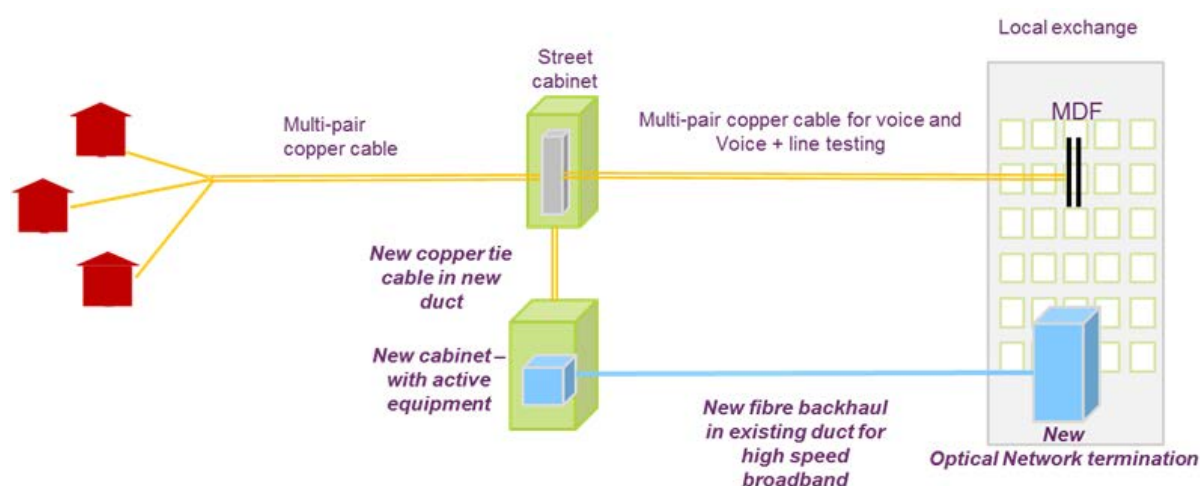
¹⁰⁹ Ofcom (June 2015), *Broadband services for SMEs: assessment and action plan*, p.41/

74. In 2014, Virgin Media sold its off-net (that is, non-LLU) broadband customers to TalkTalk.¹¹⁰ TalkTalk subsequently announced in February 2015 that it had reached an agreement for the disposal of its off-net broadband base to Fleur Telecom, part of Daisy Group, with the transaction expected to complete before the end of Q4 FY15.¹¹¹ As a result of these transactions, Virgin Media and TalkTalk no longer supply off-net broadband services.

Wholesale broadband inputs

75. Wholesale broadband inputs are discussed in Chapter 2. More detail is provided below.
76. Where connectivity is based on new fibre installation, the original copper cable remains in place and is used for voice services and line testing, as shown in Figure 12.

Figure 12: Stylised SFBB broadband network diagram



Source: CMA.

77. WBA products require only a limited number of interconnection points with the retailer's core network to provide nationwide coverage. As such, WBA products can be used by new providers entering the market, or by providers wishing to offer services in exchange areas where they have not deployed their own access network or have not unbundled the exchange. Providers using WBA are largely in a reselling role and innovation is focused at the retail level.
78. As noted above, the length of the fixed connection deployed is relevant because the distance between an end-user and the cabinet for FTTC

¹¹⁰ *The Telegraph* (January 2015), [Virgin broadband customers told: we're moving you to TalkTalk and you'll lose your email](#).

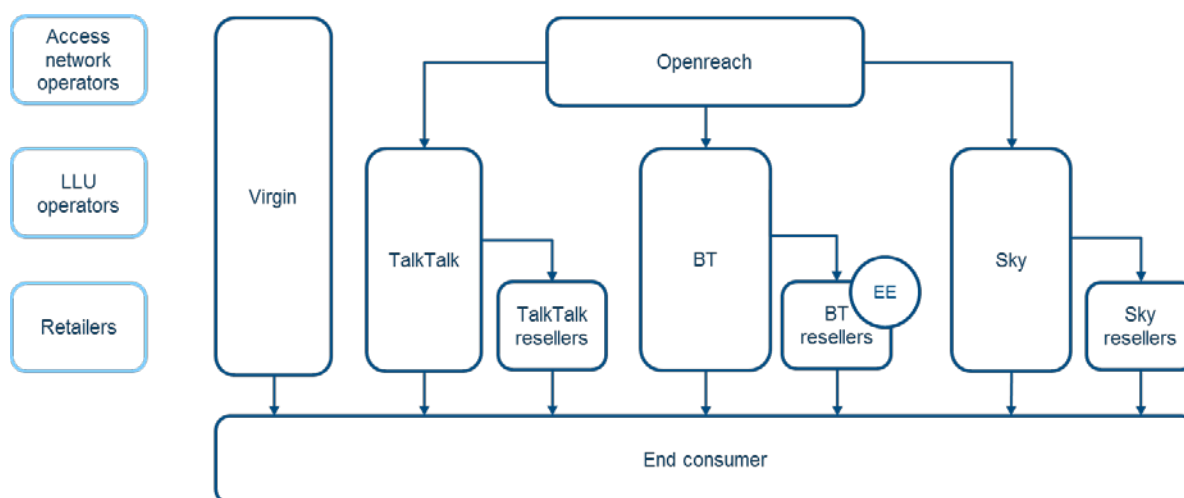
¹¹¹ TalkTalk (February 2015), [Q3 FY15 trading update](#), p3.

connections has a large effect on the speeds available. For example, BT sets its download speed caps for its two Infinity products at 38 Mbit/s and 76 Mbit/s respectively. Up to 500m away from the cabinet, these speeds can be achieved, but when premises are between 500m and 1km from the cabinet, speeds decrease significantly. According to Ofcom, beyond 1km, it is unlikely that superfast speeds will be achieved with an FTTC connection using the current BT VDSL¹¹² implementation.¹¹³ Since VDSL speeds degrade over the copper lines between the cabinet and the premises, those at the end of long lines may not be able to get download speeds of 30 Mbit/s even though they are served by cabinets that have been upgraded to fibre. By contrast, speeds do not degrade over the hybrid fibre-coaxial cable used, for example, by Virgin Media.¹¹⁴

79. The main suppliers of fixed broadband are illustrated in Figure 13, which also illustrates the wholesale inputs described in chapter 2 and above:

- (a) Own access network (Virgin).
- (b) LLU plus Openreach inputs (TalkTalk and Sky).
- (c) Resellers of WBA from BT Wholesale (for example, EE).

Figure 13: Stylised illustration of fixed broadband providers



Source: CMA.

80. Ofcom has found that BT has market power in the supply of WBA in an area referred to as Market A. Market A is an Ofcom definition for areas where there are no more than two Principal Operators present or forecast to be present in

¹¹² Very High Speed Digital Subscriber Line. A high speed technology which provides a high headline speed through reducing the length of the access line copper by connecting to fibre at the cabinet.

¹¹³ Ofcom Infrastructure Report 2014, paragraph 3.37.

¹¹⁴ Ofcom Infrastructure Report 2014, paragraph 3.36.

unbundled local BT exchanges. Market A covers 9.6% of premises and largely encompasses rural areas.¹¹⁵

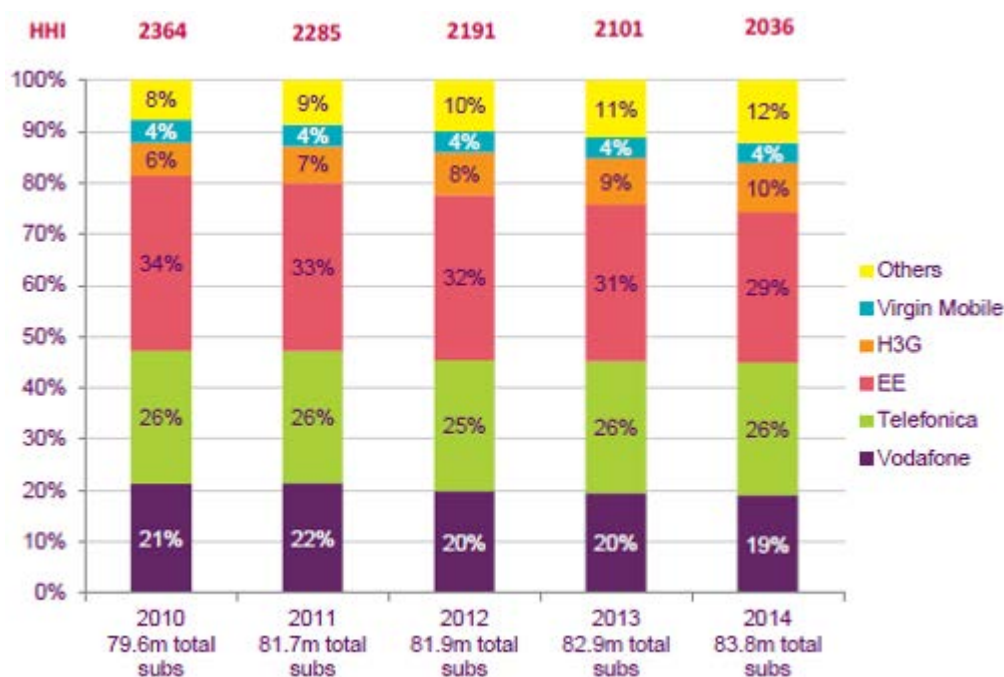
Mobile network infrastructure and suppliers

MNOs

EE

81. EE is the largest MNO with a 29% share of mobile subscribers in 2014 (see Figure 14). EE's share of subscribers has fallen since 2010 as more recent entrants (in particular H3G) have gained share.

Figure 14: Evolution of mobile operator's share of subscribers, including MVNOs



Source: Ofcom (March 2015), *Mobile call termination market review 2015-18*, p123, Figure 10.

82. EE was the first MNO to offer 4G services after Ofcom approved EE's application to 'refarm' existing 1800 MHz spectrum in 2012. EE's 4G population coverage as at March 2015 was 87% and the company had

¹¹⁵ See *Ofcom 2014 WBA review*. Market A is an Ofcom definition for areas where only 1 or 2 Principal Operators are present or forecast to be present through their own network or LLU. Market B refers to all other areas in the UK where at least 2 CPs have unbundled the local exchange (3 Principal Operators present). Principal Operators are BT, Sky, TalkTalk, Virgin Media and Vodafone. There are also further sub-divisions of Market A, including Market A1, which refers to areas where only BT is present and no other PO has unbundled the exchange or is forecast to unbundle the exchange. Market A2 refers to areas where BT is present and one other PO is present or is forecast to be present.

'double-speed' 4G coverage (see below) of 67% of the population.¹¹⁶ EE had a 4G base of 9.3 million customers as at March 2015 (a 224% increase year-on-year).

83. EE offers a '4G Extra' service featuring double speed 4G with download speeds of up to 60Mbps rather than EE's standard 30 Mbps.¹¹⁷ EE told us that it is also using carrier aggregation technology to offer headline download speeds of up to 150 Mbps via a service referred to by EE as '4G+' which was launched in October 2014 in the Central London area.
84. EE plans to roll out 'three carrier aggregation' in or before 2016 by adding further spectrum to the 4G+ service, and recent trials indicate this will enable EE to offer headline download speeds of up to 410 Mbps (which EE describes as 'Europe's fastest').¹¹⁸ EE also offers 'seamless Wi-Fi calling' which enables users to make calls and send messages without a 4G signal using handsets sold by EE with Android or Windows compatible software installed.¹¹⁹

O2

85. Telefónica has approximately 24.8 million subscribers in the UK including its online-only sub-brand giffgaff and M2M services. Based on Ofcom data (see Figure 14) O2 had a market share of subscribers of 26% in 2014. Telefónica told us that based on Q2 2015 figures for share of the whole market (including MVNOs), Telefónica has a share of [X%] excluding giffgaff and [X%] including giffgaff. Telefónica also has a 50% share of Tesco Mobile, a 50:50 joint venture between Telefónica and Tesco.

Vodafone

86. Figure 14 shows that Vodafone's market share of subscribers including MVNOs has fallen from 21% in 2010 to 19% at the end of 2014. In 2013 Vodafone established a 50:50 joint venture with Sainsbury's called Mobile by Sainsbury's.¹²⁰ We note that on 14 October 2015 Sainsbury's announced that mobile services will no longer be available after 15 January 2016.¹²¹

¹¹⁶ EE (2015), [Q1 2015 results](#), p2.

¹¹⁷ EE's 4G Extra service also includes double data allowances and other benefits such as inclusive EU roaming.

¹¹⁸ EE (2015), [Q1 2015 results](#), p2.

¹¹⁹ See [EE webpages](#).

¹²⁰ See Sainsbury's press release (July 2013): [Sainsbury's launches Mobile by Sainsbury's](#). In October 2015 Sainsbury's announced that Mobile by Sainsbury's will not operate after January 2016.

¹²¹ [Mobile by Sainsbury's announcement](#).

H3G

87. H3G was the fifth entrant to the MNO sector, but the first to offer 3G services. Ofcom has categorised H3G as a ‘challenger’ brand that has successfully marketed unlimited data tariffs under the ‘all you can eat’ service and removed roaming charges from a number of countries.¹²² H3G told us that [✂].

MVNOs

88. MVNOs provide mobile retail services to customers using commercially negotiated wholesale services provided by MNOs. The MNOs have reported to Ofcom a total of 41 direct MVNO customers.¹²³ Most of these MVNOs have a small market share with Tesco Mobile and Virgin Media, the only MVNOs with a subscriber share above 2% (see Figure 15).¹²⁴

Figure 15: MVNO mobile retail market shares by subscriber

[✂]

Source: Ofcom analysis of operator data. [Ofcom phase 2 submission](#), p28.

89. Some MVNOs are joint ventures, typically between a major retail brand and an MNO, for example Tesco Mobile and Mobile by Sainsbury’s. Tesco Mobile is a 50:50 joint venture between Telefónica and Tesco. Ofcom told us that the ownership structure and governance and commercial arrangements may constrain the ability of Tesco Mobile to operate as an independent entity on the retail mobile market.¹²⁵
90. The proportion of voice minutes used by MVNO customers has not changed since 2011, at 16% of total mobile voice minutes. However, the proportion of total mobile data used by MVNO customers has fallen to 7% (from 14% in 2011). In its SRDC, Ofcom said that this suggests that MVNO networks are more targeted at voice call markets, or that their service propositions lead to a higher proportion of such. Ofcom explained that this may be influenced by the terms available from mobile operators for MVNOs (for example whether 4G services are made available) or availability of high-end, data-focused handsets.¹²⁶

¹²² [Ofcom SRDC \(2015\)](#), paragraph 1.4.

¹²³ [Ofcom response to Issues Statement](#), paragraph 4.3

¹²⁴ [Ofcom response to Issues Statement](#), paragraph 4.3

¹²⁵ [Ofcom response to Issues Statement](#), paragraph 4.6

¹²⁶ Ofcom (July 2015), [Strategic Review of Digital Communications: Discussion document](#), paragraph 4.29.

91. Figure 16 gives the market shares of MVNOs in terms of revenue. Virgin Media's revenue share was around [redacted]% during the period shown, 2007 to 2014, while Tesco Mobile increased its market share from [redacted]% in 2007 to [redacted]% in 2014. BT also increased its share during this period, and in 2014 it accounted for around [redacted]% of mobile retail revenue. More generally, [redacted].¹²⁷

Figure 16: MVNO mobile retail market shares by revenue

[redacted]

Source: Ofcom analysis of operator data. [Ofcom response to issues statement](#).

Light and full MVNOs

92. There have been concerns raised about the ease of the process by which light MVNOs are able to switch between MNO hosts, as they typically do not control their own mobile network code (MNC), number range, or SIMs, and may not have the skills to manage a switch. For a light MVNO to develop into a full MVNO requires the cooperation of the existing MNO host. We note that whether switching is possible will depend on the business models, commercial incentives and financial capabilities of the parties concerned. H3G told us that the commercial incentives supporting a switch from a light to full MVNO can be great, both for the MVNO concerned as well as the MNO host (who could share in the benefits of its MVNO partner growing), and in H3G's view, this means that there are commercial benefits which can incentivise the cooperation of an existing MNO host when switching.
93. Several new entrants to the mobile market appear to be focused on full MVNO models, and some are targeting quad-play opportunities. Recent new entrants operating as light MVNOs include the Post Office and Dixons Carphone.¹²⁸ Dixons Carphone launched its 'iD' MVNO offer hosted by H3G in May 2015, having previously acted as a reseller of subscriptions for Talk Mobile.¹²⁹ Talk Mobile has been a subsidiary of Vodafone since 2012.¹³⁰ In January 2015 Sky announced plans to launch a mobile service.
94. For further details on the differences between light MVNOs and full MVNOs, see Table 7.

¹²⁷ [Ofcom response to issues statement](#), paragraph 4.10.

¹²⁸ EE told us that it believes that whilst [redacted].

¹²⁹ See [Results announcement](#), p4.

¹³⁰ See registered company number 04154716.

Table 7: MVNO business models

<i>Type of MVNO</i>	<i>Network perspective</i>	<i>Business perspective</i>	<i>Business motivation</i>
Light MVNO	MVNO customer uses host MNO mobile network code (MNC) and SIMs are registered on the MNOs home location register (HLR). Mobile traffic and routing is managed by the MNO. SIMs are MVNO-branded and the customer sees the MVNO as the network provider.	Most or all business systems provided by host MNO. Light MVNOs may choose to run their own customer service business systems, including billing and customer relationship management (CRM).	Lower-capital, lower-risk model for the MVNO. Limited requirement for telecoms expertise/capabilities in terms of core network infrastructure and customer services. Companies looking to extend brands from unrelated markets into mobile might typically chose this type of MVNI to launch a mobile offering. Also chosen by MVNOs who prefer an MNO to manage the core network, or by MVNOs wishing to launch quickly. Most common set-up through contractual arrangements but can also be as part of a joint venture with an MNO.
Full MVNO	MVNO generally routes its own traffic including all interconnect. MVNO customer treated as if roaming customer and hosted on MNO's visitor location register (VLR), which is a database that contains information about the subscribers roaming within a mobile switching centre's (MSC) location area. MVNO controls its own mobile network code (MNC) and number range and issues its own SIMs.	Most or all business systems managed by MVNO. Often integrated with other business support systems/operational support systems to facilitate other services such a fixed/mobile integration.	Higher-capital, higher-risk model, longer lead time to launch. Can be attractive for fixed operators looking to extend their telecoms expertise into mobile. Typical for more experienced telecoms companies looking to extend expertise into mobile. Can also allow full MVNO to resell to light MVNOs (as an MVNE).

Source: CMA.

MVNEs and MVNAs

95. MVNOs also vary in whether they buy wholesale mobile services directly from MNOs, or through a Mobile Virtual Network Aggregator (MVNA). MVNAs are third party wholesale providers of wholesale mobile access services, which enter into agreements with MNOs to purchase these services on a wholesale basis and resell them to MVNOs. A Mobile Virtual Network Enabler (MVNE) provides business infrastructure solutions to MVNOs.
96. There are several operators in the MVNE/MVNA segment including Gamma, Good (formerly Macheen), Hue, Transatel and X-Mobility.¹³¹ Hutchison Whampoa Group launched Hue's 'operator-led, end-to-end Mobile Virtual Network Enabler' service in April 2015.¹³² H3G told us that [X] recently signed a contract to switch [X].

¹³¹ See the [Transatel](#) website.

¹³² See Hutchison Whampoa Group press release (April 2015): [Hue launches global end-to-end enabler of virtual mobile networks](#).

MNO network coverage and topology

MNO network coverage

97. Table 8 shows 4G network coverage by MNO.

Table 8: 4G coverage by MNO, outdoor premises coverage, by network, March 2015

	%			
	<i>EE</i>	<i>Vodafone</i>	<i>O2</i>	<i>H3G</i>
Coverage of UK premises	81	65	66	53

Source: Ofcom CMR (2015), Figure 4.3.

98. Network coverage can also be measured by premises (outdoors and indoors), and by other geographic dimensions, including along major roads (see Table 9). There are some areas of the UK, including some urban areas with no mobile network coverage, known as ‘not-spots’.

99. There is more variation between the operators’ 3G and 4G coverage than between their 2G coverage. For example, EE and H3G have significantly greater 3G coverage than O2 and Vodafone, as shown in Table 9.

Table 9: Coverage by MNO

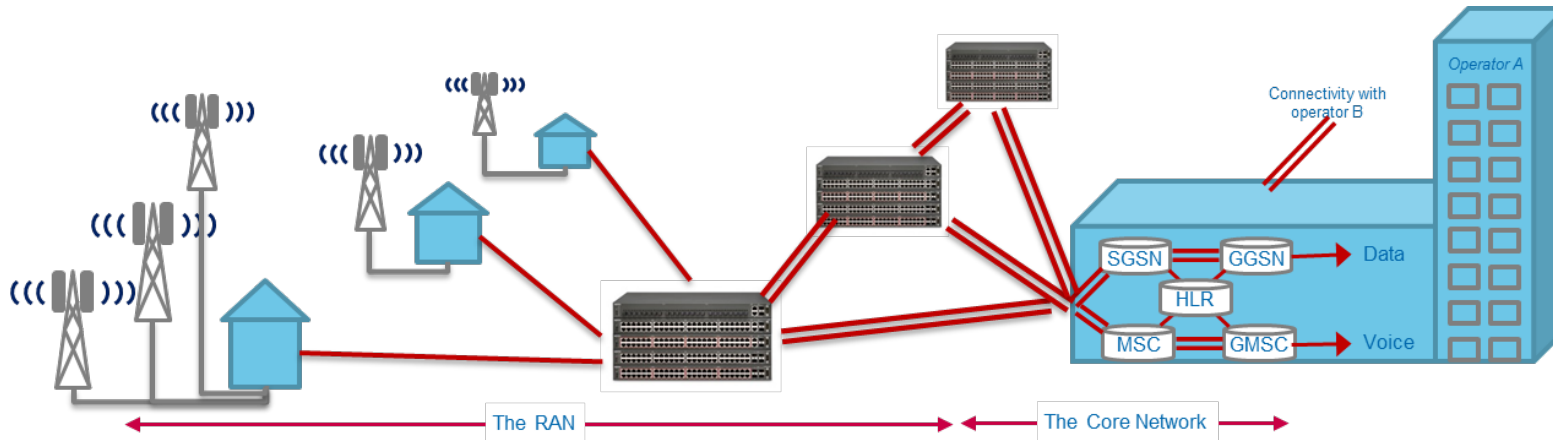
<i>MNO coverage predictions – by operator</i>		<i>O2</i>	<i>Vodafone</i>	<i>EE</i>	<i>H3G</i>
Premises (outdoors)	3G	91	87	98	98
	4G	43	37	68	n/a
Premises (indoors)	3G	84	76	93	93
	4G	38	32	59	n/a
In-car (A and B roads)	3G	44	37	78	73
	4G	14	10	26	n/a
Geographic (land area)	3G	44	33	74	68
	4G	9	7	19	n/a

Source: [Ofcom Infrastructure Report 2014](#), paragraph 1.46.

MNO network topology

100. The topology of a mobile network is show below in Figure 17.

Figure 17: Stylised network diagram of mobile network – radio sites, backhaul and core



Cell site (1000s)			Controller / Aggregation site (100s)			Core network (10s)				
Antenna	Land & Mast	Cabinet with electronics	Connectivity from Node B / BTS to RNC / BSC, or eNodeB to PoA	RNC / BSC / PoA ironwork	RNC / BSC line card & software	Connectivity from Controller / PoA to core	MSC / SGSN or MME / SGW	GMSC / GGSN or PGW	Network Operations & Planning	Back Office (interface with Business Operations)
Antennas are used to transmit and receive radio waves. Typically, antennae are installed on masts.	Land rarely owned by network. Several major landlords provide sites e.g. Arqiva. Site adapted by operator based on requirements for masts etc.	A cabinet is usually installed near the mast containing the RF amplifier, Base Band processor, and backhaul transmission equipment	Usually connectivity is provided by a third party such as BTW, Virgin Media, MLL, using either copper, fibre, or microwave links. Connectivity is typically part of the Business Connectivity Market.	Physical cabinet containing Controller or Aggregator hardware. This may be in one of the operators core nodes' location.	Equipment that controls the operation of many cells. Multiple Controllers are interconnected, or collocated.	Using high capacity fibre Network connections owned or leased in large individual deals by individual networks	MSC connection point for voice calls and SGSN for data traffic. MSC's of multiple operators are connected.	GMSC connection to the external PSTN network and GGSN connection to the internet	Vendor provided solution to monitor and control network performance. Optimisation and fault control performed here	User billing based on operator price plans and subscriber usage patterns performed here

Source: CMA.

Financial performance of companies

Introduction

1. This background working paper describes the main parties to the merger under consideration and summarises their high-level financials. The main parties in this case are BT and EE. We also set out some high level summary financial information for selected third parties.

BT

Overview of current business

2. The principal activities of BT comprise the sale of telecommunications products and services, the provision of managed networked IT services to large multinational corporations, domestic businesses and the public sector, as well as the wholesale of telecommunications services to other communications providers.¹
3. BT is the largest provider of fixed network services in the UK. With the exception of Hull, BT has a Universal Service Obligation² on its physical network in the UK.
4. BT re-launched its consumer mobile services in March 2015, as an MVNO on EE's network. It offers SIM-only deals with bundles of 4G data, minutes and texts to all consumers, with a discount on BT's mobile services offered to existing BT broadband home customers. BT has been active in the business segment of the retail mobile market since it spun-off mmO2 (previously BT's own mobile business, now O2) in 2001.
5. BT's three retail divisions are:
 - (a) BT Consumer, which offers BT-branded fixed-line voice, broadband, and TV services directly to UK homes, BT mobile services to UK consumers, and various consumer devices through third-party high street retailers;

¹ [British Telecommunications Annual Report & Form 20-F 2015](#), p55.

² Oftel (2003), [Designation of BT and Kingston as universal service providers, and the specific universal service conditions](#), p5, paragraph 1.1. The Universal Service Obligation '...means that basic telephone services should be available to everybody upon a reasonable request and at an affordable price'.

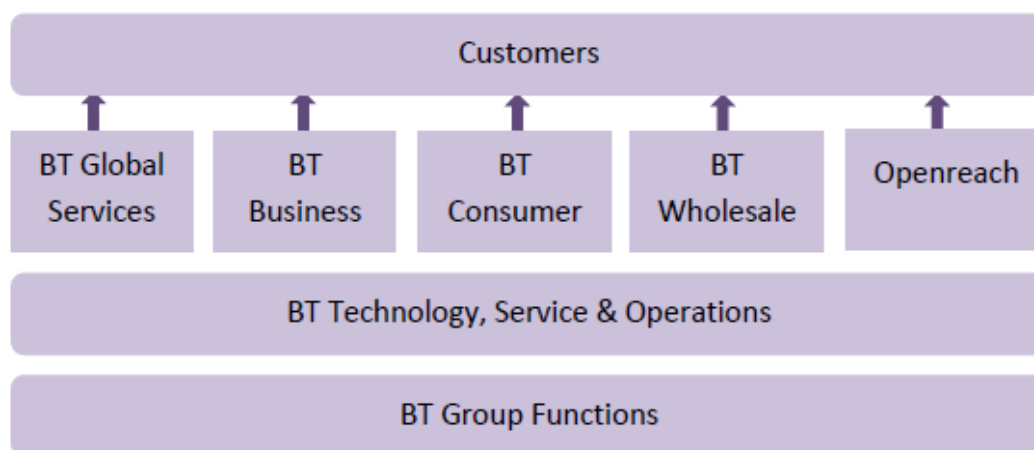
- (b) BT Business, which provides fixed-voice, broadband, mobile, and IT services to small and medium-sized enterprises; and
- (c) BT Global Services, which offers managed network IT services to large corporate and public sector customers.

6. BT's two wholesale divisions are:

- (a) BT Wholesale, which sells voice, broadband, and data communications products and services, including backhaul, to fixed and mobile network operators. It combines these products and its own services with third-party components to offer managed solutions; and
- (b) Openreach, which provides local loop or local access network services and regulated backhaul and leased line services to fixed and mobile operators, offers various products including:
 - (i) Ethernet access;
 - (ii) optical services;
 - (iii) superfast fibre access;
 - (iv) copper access via local loop unbundling and wholesale line rental; and
 - (v) physical infrastructure access (PIA), also known as 'Duct and Pole sharing'.³

³ See the [Openreach](#) webpages. The operational, engineering, and systems capabilities of Openreach are functionally separate from those of the rest of the BT group.

Figure 1: Diagram showing BT's business structure



Source: BT.

A short history

7. Below is a brief history of BT and its ownership before the merger under consideration.

Table 1: A brief history of BT

<i>Date</i>	<i>Event</i>
1969	Post Office Act 1969 gave the Post Office exclusive privilege of running telecommunications systems in the UK.
1981	British Telecommunications Act transferred responsibility of the UK telecommunications services from the Post Office to British Telecom, both public corporations.
19 July 1982	British Telecom privatisation announced.
12 April 1984	Telecommunications Act 1984 received Royal Assent, effectively reversing BT's exclusivity privilege.
6 August 1984	British Telecom business transferred to British Telecommunications plc, with 50% of British Telecom shares sold to the public in November of that year, and most of the remainder by December 1991.
7 January 1985	Joint venture (60:40) between British Telecom and Securicor launches Cellnet, a cellular radio service.
2 April 1991	British Telecom rebranded as 'BT', with new corporate structure.
July 1999*	BT acquires Securicor's minority share of Cellnet and rebrands as 'BT Cellnet'.
December 2000	BT required to offer local loop unbundling to other telecommunications operators.
November 2001	BT Cellnet demerged from BT and re-branded 'mmO2' (later to become 'O2').
January 2006	Openreach launched, reporting directly to BT's Chief Executive, as an undertaking in lieu of a Competition Commission market investigation; Openreach is to manage the UK's telecommunications infrastructure and treat the rest of BT on an equal basis as other operators. The entity is regulated by EOI (equivalence of input) rulings.
15 December 2014	Orange and T-Mobile enter into exclusive negotiations with BT to sell EE.

Source: See BT's [Our History](#) webpage.

*See the [BT Archives](#) webpage.

Strategy

8. In its 2015 annual report, BT outlined its five strategic areas for near-term future investment.⁴ BT described these as:
- (a) **Fibre** – superfast fibre broadband currently covers more than three quarters of the UK, expanded to be available to a further 3 million premises in the last financial year.⁵ BT also plans to deploy G.fast, which is expected to deliver speeds of up to 500 Mbps to most of the UK within a decade, and introduce a 1 Gbps premium fibre broadband service.
 - (b) **TV and content** – BT has redesigned and enhanced the service. New features have been added, including TV everywhere, buy-to-keep, Netflix, and the BT Sport red button. BT Sport became the new home of UEFA Champions League and UEFA Europa League football in the summer of 2015.
 - (c) **Mobility and future voice** – further broken down into three sub-areas.
 - (i) In the year to 31 March 2015, BT launched three new business products:
 - BT Cloud Voice, which unifies communications capabilities;
 - BT Cloud phone, a hosted communications service tailored for smaller, simpler SMEs; and
 - BT One Phone, a cloud-based solution which takes calls from an individual's various fixed line, extension and mobile numbers and redirects them to a single handset.⁶
 - (ii) BT also returned to the consumer mobile market in 2015 with BT Mobile, which offers SIM-only plans that come with 4G and unlimited access to BT Wi-Fi hotspots in the UK.⁷
 - (iii) BT agreed definitive terms to acquire EE. This deal will accelerate BT's mobile strategy, which absent the merger is based on organic growth as an MVNO, and increase its capacity for future investment and innovation.

⁴ BT Group plc Annual Report and Form 20-F 2015, p26.

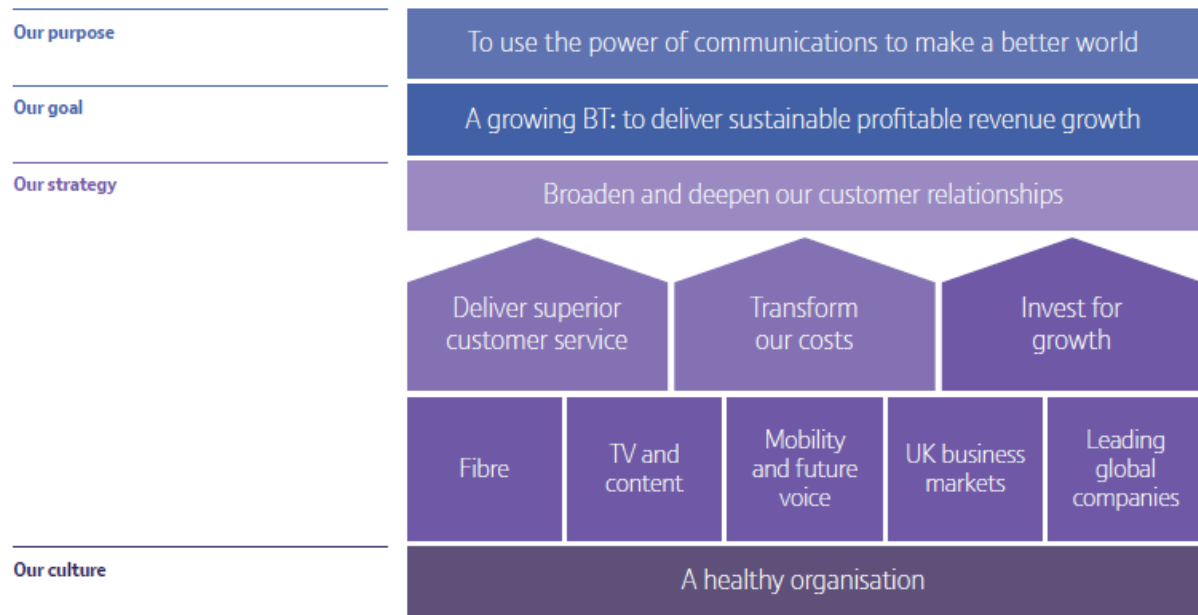
⁵ BT Group plc Annual Report and Form 20-F 2015, p73.

⁶ BT Group plc Annual Report and Form 20-F 2015, p63.

⁷ BT Group plc Annual Report and Form 20-F 2015, p67.

- (d) **UK business markets** – BT has identified opportunities to increase its revenue from each business customer. It has improved its product portfolio and is focusing on selected IT services for growth.
- (e) **Leading global companies** – BT is investing in its services, network, and expertise to increase its share of spending by large multi-national customers.⁸

Figure 2: Diagram showing how the five strategic areas outlined above fit into BT’s 2015 business model



Source: [BT Group plc Annual Report and Form 20-F 2015](#), p21.

Company structure and significant entities

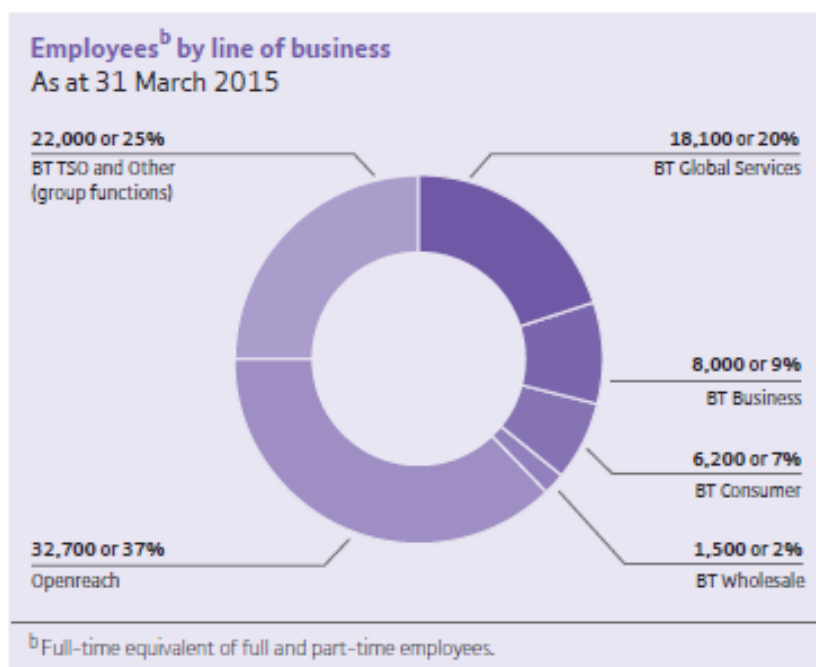
9. There are 65 entities in the BT group, including BT Group plc, of which 49 are domiciled in the United Kingdom – these are set out in Table 1 in Annex 1.
10. British Telecommunications plc is both a wholly owned subsidiary and the principal operating subsidiary of BT Group plc.⁹ With the exception of BT Group Nominees Limited, BT Group Investments Limited and BT Epic (Jersey) Limited, all other entities are subsidiaries of British Telecommunications plc, which is a wholly owned subsidiary of BT Group plc. British Telecommunications plc is part of the BT Group Functions line of business.

⁸ [BT Group plc Annual Report and Form 20-F 2015](#), p26.

⁹ [British Telecommunications Annual Report & Form 20-F 2015](#), p2.

11. BT Managed Services Limited, a wholly owned subsidiary of BT Group plc, is responsible for the provision of wholesale telecommunications services in the UK.¹⁰ The principal activity in this regard is the provision and management of the outsourced network service contracts to other UK telecommunications providers.¹¹ BT Managed Services Limited is the only fully consolidated entity in the BT Wholesale line of business.
12. Plusnet plc, a wholly-owned subsidiary of BT Group plc, is active in the provision of retail fixed line telephone and broadband internet access services in the UK.¹² Plusnet is part of the BT consumer line of business.
13. BT's business structure is different from BT's legal entity structure; all of Openreach's business, most of BT Wholesale and Consumer's business and some of BT Business and BT Global Services UK business is within British Telecommunications plc.
14. At 31 March 2015, 70,900 of BT's 88,500 full-time equivalent employees were based in the UK.¹³ Out of the 88,500 global employees, almost 40% are employed within Openreach.

Figure 3: Total global BT Group employees split by line of business, as at 31 March 2015.



Source: BT Group plc Annual Report & Form 20-F 2015, p54.

¹⁰ BT Managed Services Limited Financial Statements for the year ended 31 March 2014, p2.

¹¹ BT Managed Services Limited Financial Statements for the year ended 31 March 2014, p3.

¹² Plusnet plc Financial Statements for the year ended 31 March 2014, p4.

¹³ BT Group plc Annual Report and Form 20-F 2015, p31, paragraph 1.

EE

Overview of current business

15. The principal activities of EE comprise the provision of telecommunications products and services. As an MNO, EE delivers mobile and fixed communications services to retail customers, including businesses and government, and wholesale mobile services to MVNOs. EE operates exclusively in the UK and runs the EE, Orange and T-Mobile brands.
16. EE's consumer retail products include:
- (a) Devices and accessories (phones, tablets, dongles, cameras);
 - (b) Mobile services consisting of voice, messaging and data services, available on both pre- and post-pay call and data plans;
 - (c) Fixed voice and broadband;
 - (d) Superfast broadband; and
 - (e) Pay TV (available to retail customers). Unlike BT, EE is only a retailer and does not produce content or provide TV channels on a wholesale basis.
17. EE was the first of the UK MNOs to launch its 4G mobile service, in October 2012; its service coverage is shown in Table 2.¹⁴

Table 2: EE's UK mobile service coverage by technology as at January 2015

<i>Technology</i>	<i>% Coverage of UK population</i>
2G	99
3G	98
4G	80
Superfast fibre broadband	54
ADSL broadband	98.7

Source: EE '[A bit about us](#)' webpage.

18. EE provides wholesale mobile services by making its network available to MVNOS, currently hosting more than 30 MVNO brands on its 2G, 3G and 4G networks.¹⁵ It should be noted that access to the 4G network is limited; not all MVNOs have access to the 4G service.

¹⁴ See EE '[A bit about us](#)' webpage.

¹⁵ [EE initial submission](#), p3. One of the MVNOs hosted by EE is Virgin Media, which the submission states is the second largest MVNO in the UK.

A short history

19. Below is a brief history of EE and its ownership before the merger under consideration.

Table 3: A brief history of EE

<i>Date</i>	<i>Event</i>
15 October 1987	Orange Personal Communications Services Limited incorporated.
10 May 1989	T-Mobile (UK) Limited incorporated.
7 September 1993*	Mercury One2One (bought by T-Mobile in 1999) launched in the UK.†
28 April 1994*	Orange launched in the UK.
September 2009	Orange SA and Deutsche Telekom AG announced their agreement to combine their respective UK mobile businesses as a 50:50 joint venture.
1 April 2010	Joint venture completed with T-Mobile (UK) (a subsidiary of Deutsche Telekom) as the parent company of the combined entity.
1 July 2010	T-Mobile (UK) Limited renamed Everything Everywhere Limited.
30 October 2012	Everything Everywhere Limited becomes the first UK mobile network operator to launch 4G services commercially.
October 2012	Pay TV available to EE customers launched.
2 September 2013‡	Everything Everywhere Limited renamed EE Limited.
15 December 2014	Orange and T-Mobile enter into exclusive negotiations with BT to sell EE.

Source: BT

*See Orange 'about' webpage.

†See the [Mobile phone history](#) website.

‡ Date confirmed by EE (March 2014), [Prospectus](#), p1.

Strategy

20. EE's strategy is focused on three core areas: driving customer loyalty; ensuring operational excellence; and creating the platform for secure long term growth.¹⁶
21. As part of the investment in its Network Coverage Manifesto, EE is committing to:
- (a) voice and 4G data coverage across 90% of the UK's geography;
 - (b) using Micro Network technology to make phone calls and mobile data available in 1,500 communities that are not currently connected by either reliable mobile or high speed broadband;
 - (c) mobile voice coverage of more than 90% of the UK's 245,000 miles of roads by 2017, up from the current coverage of around 82%, focusing on

¹⁶ [EE Limited Annual Report Year ended 31 December 2014](#), p4, paragraph 4.

motorways first, then A and B roads, as well as specific 4G expansion to cover the country's busiest train routes;

- (d) deployment of low frequency 800MHz spectrum across the EE rural network to expand the EE's reach by more than 1,500 square miles; and
- (e) a call completion rate of 99.6%, the network carries more than 150 million calls per day.¹⁷

Company structure and significant entities

- 22. The EE group structure chart as at 31 December 2014 is set out in Figure 1 of Annex 1.
- 23. EE has a 50% share in MBNL, a network sharing joint venture with H3G (refer to paragraph 108 for more information).
- 24. EE has approximately 13,000 full time employees and 580 retail stores (58 stores were added due to the acquisition of Phones4U in October 2014),¹⁸ and serves more than 30 million customers across its mobile, fixed and wholesale businesses.¹⁹

BT's financials

- 25. For the year ending 31 March 2015, BT Group plc reported external adjusted revenue of £17,851 million (£18,287 million in 2014), adjusted EBITDA of £6,271 million (£6,116 million in 2014), and adjusted earnings per share of 31.5 pence (28.2 pence in 2014).²⁰
- 26. As outlined in the company overview above, BT Group has five distinct lines of business: Consumer; Business; Wholesale; Openreach and Global Services.
- 27. BT Global services is the largest line of business by revenue, generating 38% of the group's external revenue. BT Consumer is the next largest contributing 24%.²¹
- 28. Around 60% of Openreach's revenue is generated from other BT lines of business so its contribution to the group's external revenue is the smallest, at

¹⁷ See EE 'A bit about us' webpage, 'Delivering the best network'.

¹⁸ EE Limited Annual Report Year ended 31 December 2014, p5.

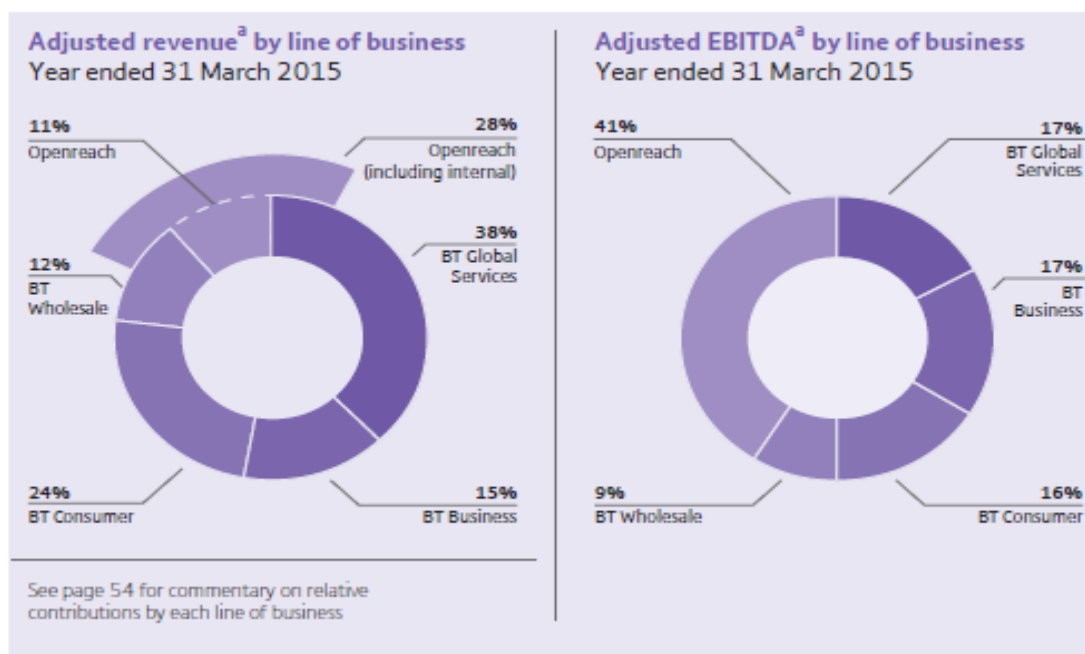
¹⁹ See EE 'A bit about us' webpage, 'A little bit more about us'.

²⁰ BT Group plc Annual Report and Form 20-F 2015, p7.

²¹ BT Group plc Annual Report and Form 20-F 2015, p54.

11%. Total Openreach revenue is equivalent to 28% of group revenue and it is the group's largest EBITDA contributor, generating 41% of the total. This contribution reflects the return it earns on its extensive network assets,²² but as a capital-intensive business, Openreach incurs costs relating to depreciation, which are not reflected in the EBITDA contribution.²³

Figure 4: BT Group plc's external adjusted revenue and EBITDA by line of business, for the year ending 31 March 2015



Source: [BT Group plc Annual Report and Form 20-F 2015](#), p7.

Specific revenue analysis

29. Since some of the revenue produced in the BT group is through internal supply between lines of business, it is necessary to remove those revenues generated by self-supply in order to assess external revenue (that is revenue to all non-BT parties, including other telecommunications providers, other businesses, and end consumers). Table 4 sets out British Telecommunications plc's segmental revenue identifying the elements of self-supply.

²² Openreach's return on capital employed for the year to 31 March 2014 was 5.2% (5.8% in 2013), per the regulatory accounts. See BT (2014), [Current Cost Financial Statements 2014 including Openreach Undertakings](#), p119.

²³ [BT Group plc Annual Report and Form 20-F 2015](#), p54.

Table 4: BT's segmental revenue for the year to 31 March 2015, identifying self-supply

	<i>£m</i>						
	<i>BT Global Services</i>	<i>BT Business</i>	<i>BT Consumer</i>	<i>BT Wholesale</i>	<i>Openreach</i>	<i>Other</i>	<i>Total</i>
Internal revenue							
BT Global Services	0	241	20	0	187	0	448
BT Business	29	0	22	0	306	0	357
BT Consumer	0	62	0	0	939	0	1,001
BT Wholesale	0	94	2	0	242	0	338
Openreach	0	1	0	0	0	46	47
Other*	0	1	18	0	1,390	0	1,409
Total internal revenue	29	399	62	0	3,064	46	3,600
Total external revenue	6,750	2,746	4,223	2,158	1,947	28	17,852
Total segmental revenue	6,779	3,145	4,285	2,158	5,011	74	21,452

Source: [British Telecommunications Annual Report & Form 20-F 2015](#), p74.

*The majority of internal trading relates to Openreach and arises on rentals, and any associated connection or migration charges, of the UK access lines and other network products to the customer-facing lines of business. This occurs both directly, and also indirectly, through the BT Technology, Service and Operations (TSO) division, which is included within the 'Other' segment.

30. Table 4 shows that total external revenue from the three retail lines of business was £13,719 million for the year to 31 March 2015, representing 77% of total group income. The total external revenue from the wholesale divisions was £4,105 million, representing the remaining 23% of total group income.
31. The external adjusted revenue reported by the group can be split out across its product and service lines as follows:

Table 5: BT's revenue for the years to 31 March 2015 and 2014, categorised by products and services

	<i>£m</i>	
<i>Products and services</i>	<i>2015</i>	<i>2014</i>
ICT and managed networks	6,493	6,608
Broadband, TV and convergence	3,540	3,205
Calls and lines and connectivity	5,969	6,064
Transit	555	697
Other products and services	1,294	1,713
Total revenue	17,851	18,287

Source: [British Telecommunications Annual Report & Form 20-F 2015](#), p75.

32. While not reported in this way, upon our request BT has allocated the external revenue for the two most recent financial years, and for the most recent three-month internal reporting period, into retail and business income as follows.

Table 6: BT's external revenue for the two years to 31 March 2015, and the most recent three-month internal reporting period, categorised by retail and business

Category	FY 2015		FY 2014		3 month period	
	[£]	[£]	[£]	[£]	[£]	[£]
Retail consumer	[£]	[£]	[£]	[£]	[£]	[£]
Retail business – SME*	[£]	[£]	[£]	[£]	[£]	[£]
Retail business - Large enterprises	[£]	[£]	[£]	[£]	[£]	[£]
Retail business - Government & Health	[£]	[£]	[£]	[£]	[£]	[£]
Retail business - N Ireland	[£]	[£]	[£]	[£]	[£]	[£]
Total business	[£]	[£]	[£]	[£]	[£]	[£]
Wholesale - BT Wholesale	[£]	[£]	[£]	[£]	[£]	[£]
Wholesale - Openreach	[£]	[£]	[£]	[£]	[£]	[£]
Total wholesale	[£]	[£]	[£]	[£]	[£]	[£]
Other†	[£]	[£]	[£]	[£]	[£]	[£]
Total	[£]	[£]	[£]	[£]	[£]	[£]

Source: [£].

*Customer revenue is allocated to the SME category where it relates to UK businesses with less than or equal to 50 employees.

†'Other' includes revenue from the BT Global Services line of business outside the UK, Ireland (Republic of Ireland), and other BT businesses that fall outside of the categories listed in the table, for example IT services and Tikit.

33. Per the BT Group plc 2015 accounts, BT is the largest supplier of networked IT services to the UK public sector, working with more than 1,300 organisations across central, local and devolved government, healthcare, police and defence.²⁴
34. Taking the retail categories, BT has further allocated the revenue by different products as follows.

²⁴ BT Group plc Annual Report and Form 20-F 2015, p38.

Table 7: BT's external retail revenue for the two years to 31 March 2015, and the most recent three-month internal reporting period, categorised by product line

Category	FY 2015		FY 2014		3-month period	
	April 14 - March 15		April 13 - March 14		April - June 15	
	£m	% of total revenue	£m	% of total revenue	£m	% of total revenue
<i>Consumer</i>						
Mobile	[X]	[X]	[X]	[X]	[X]	[X]
Fixed voice†	[X]	[X]	[X]	[X]	[X]	[X]
Broadband‡	[X]	[X]	[X]	[X]	[X]	[X]
Superfast broadband§	[X]	[X]	[X]	[X]	[X]	[X]
TV	[X]	[X]	[X]	[X]	[X]	[X]
Other¶	[X]	[X]	[X]	[X]	[X]	[X]
Total consumer	[X]	[X]	[X]	[X]	[X]	[X]
<i>Business</i>						
Mobile	[X]	[X]	[X]	[X]	[X]	[X]
Fixed voice†	[X]	[X]	[X]	[X]	[X]	[X]
Broadband#	[X]	[X]	[X]	[X]	[X]	[X]
Superfast broadband§	[X]	[X]	[X]	[X]	[X]	[X]
Other¶	[X]	[X]	[X]	[X]	[X]	[X]
Total business	[X]	[X]	[X]	[X]	[X]	[X]

Source: BT

*2013 mobile revenue generated by BT's legacy Fusion consumer mobile offering.

†Fixed voice includes calls and line rental.

‡Retail consumer broadband includes revenue of £61m from Plusnet, which is derived from both copper and fibre connections.

§This is revenue from fibre connections only.

¶The 'Other' category includes revenue from BT's Wi-Fi offerings. For the business categories, it also captures BT's provision of business services, for example IT services, data storage, and conferencing

#This is revenue from copper connections, but also includes all revenue from BT Global Services, which includes both copper and fibre connections. BT Global Services does not currently split revenue from the supply of broadband between standard and superfast.

35. The income generated from the sale of mobile backhaul by BT to the UK MNOs is as follows.

Table 8: Income received by BT in the years to 31 March 2015 and 2014 from the sale of mobile backhaul to UK MNOs

Customer name	£m	
	2015	2014
MBNL	[X]	[X]
Vodafone	[X]	[X]
O2	[X]	[X]
H3G	[X]	[X]
EE	[X]	[X]

Source: BT.

36. [X]

Costs

37. As described in the BT company structure section above, BT's business structure is different from BT's legal entity structure. For management and external reporting purposes, the costs incurred in BT Technology, Service & Operations (TSO, BT's internal service unit) and Group Functions are allocated to the customer facing lines of business. For the purposes of

external reporting, BT also allocates TSO's cash flow to the five customer facing lines of business (see illustrative Figure 1 in paragraph 6).

38. BT's cost accounting system uses a multi-stage process to attribute all its costs, assets, revenues, and liabilities to the Services and Markets that BT serves. The system encompasses hundreds of cost pools ('cost categories') and uses a variety of methods to attribute costs from the categories in one stage to the next.²⁵ The stages are represented in Figure 2 of Annex 1.
39. BT told us that the BT group allocates common costs in accordance with principles/methodology approved by Ofcom.

Capital structure

40. BT's capital structure consists of net debt and shareholders' equity. At 31 March 2015, BT held net debt of £5,119 million and total parent shareholders' equity of £796 million.²⁶

Balance sheet

41. As at 31 March 2015, the group had total assets of £25,710 million (£23,517 million in 2014) and total liabilities of £24,902 million (£24,109 million in 2014).²⁷ Also as at 31 March 2015, BT had a ratio of net debt to adjusted EBITDA of 0.8 times and reported interest cover of 4.1 times.²⁸

Spectrum

42. In the most recent spectrum auction held by Ofcom in February 2013, BT Group plc invested £201.5 million on 2 x 15 MHz of 2.6 GHz and 1 x 25 MHz of unpaired 2.6 GHz,²⁹ (this includes 10 MHz of spectrum licensed for restricted power). This purchase increased BT's total spectrum holding to 2 x 15 MHz of paired 2.6 GHz, 25 MHz of unpaired 2.6 GHz, 2 x 3.3 MHz of 1.8 GHz (used in picocell connectivity), and 2 x 126 MHz of 32 GHz (used for fixed point to point links).
43. BT's paired spectrum is currently being used in trials of femtocells and picocells at a number of UK locations, which BT plans to launch commercially for use in consumer homes and as an enhancement of its current business proposition. The unpaired spectrum could be used for femtocells but is

²⁵ Ofcom (June 2015), [BT Cost Attribution Review](#), p25.

²⁶ [BT Group plc Annual Report and Form 20-F 2015](#), p183.

²⁷ [ibid](#), p88.

²⁸ [ibid](#), p208. Interest cover is the number of times net finance expense is covered by operating profit.

²⁹ [Ofcom \(March 2013\) Final 4G awards](#).

currently also being considered for fixed broadband access and as a means to improve wireless connectivity within homes.

EE's financials

44. For the year ending 31 December 2014, EE Limited reported adjusted revenue of £6.3 billion (£6.5 billion in 2013), adjusted EBITDA (excluding restructuring, one-off costs, brand and management fees) of £1,589 million (£1,574 million in 2013) and a loss after tax for the year of £217 million (£76 million in 2013).³⁰

Specific revenue analysis

45. Group revenue from mobile services was £5,619 million for the year ending 31 December 2014 (£5,734 million in 2013). The remaining £708 million revenue for the year (£748 million in 2013) was earned on equipment, fixed broadband and wholesale revenues.³¹
46. EE has provided us with its total UK revenue for the last two financial years and the latest three-month internal reporting period, split by retail and wholesale as follows.

Table 9: EE's UK revenue for the two years to 31 December 2014, and the most recent three-month internal reporting period, split by retail and business

Revenue stream	FY 2014		FY 2013		3-month period	
	1 January – 31 December		1 January – 31 December		April – June 15	
	£m	% of total revenue	£m	% of total revenue	£m	% of total revenue
Retail consumer – mobile	[X]	[X]	[X]	[X]	[X]	[X]
Retail consumer – broadband	[X]	[X]	[X]	[X]	[X]	[X]
Total retail	[X]	[X]	[X]	[X]	[X]	[X]
Retail business – SME mobile	[X]	[X]	[X]	[X]	[X]	[X]
Retail business – Large enterprises	[X]	[X]	[X]	[X]	[X]	[X]
Retail business – Government	[X]	[X]	[X]	[X]	[X]	[X]
Total business	[X]	[X]	[X]	[X]	[X]	[X]
Wholesale (MVNO)	[X]	[X]	[X]	[X]	[X]	[X]
Other	[X]	[X]	[X]	[X]	[X]	[X]
Total	[X]	[X]	[X]	[X]	[X]	[X]

Source: EE.

47. Taking the retail categories, EE has further allocated the UK revenue by different products as follows.

³⁰ EE Limited Annual Report Year ended 31 December 2014, p6.

³¹ EE Limited Annual Report Year ended 31 December 2014, p40.

Table 10: EE's UK retail revenue for the two years to 31 December 2014, and the most recent three-month internal reporting period, split by product

Revenue stream	FY 2014		FY 2013		3-month period	
	1 January – 31 December		1 January – 31 December		April – June 15	
	£m	% of total revenue	£m	% of total revenue	£m	% of total revenue
<i>Consumer</i>						
Mobile – voice and messaging	[X]	[X]	[X]	[X]	[X]	[X]
Mobile – data	[X]	[X]	[X]	[X]	[X]	[X]
Mobile – handsets and accessories	[X]	[X]	[X]	[X]	[X]	[X]
Access fees	[X]	[X]	[X]	[X]	[X]	[X]
Home broadband	[X]	[X]	[X]	[X]	[X]	[X]
Other*	[X]	[X]	[X]	[X]	[X]	[X]
Total consumer	[X]	[X]	[X]	[X]	[X]	[X]
<i>Business</i>						
Mobile – voice and messaging	[X]	[X]	[X]	[X]	[X]	[X]
Mobile – data	[X]	[X]	[X]	[X]	[X]	[X]
Mobile – handsets and accessories	[X]	[X]	[X]	[X]	[X]	[X]
Access fees	[X]	[X]	[X]	[X]	[X]	[X]
Other*	[X]	[X]	[X]	[X]	[X]	[X]
Total business	[X]	[X]	[X]	[X]	[X]	[X]

Source: EE.

*The 'other' category primarily includes insurance revenue.

Costs

48. The EE Group considers its provision of communication products and services to be 'a single group of services and products provided by an inter-dependent asset infrastructure, to one geographical area'. It produces all operating results, forecasts and budgets on a consolidated level for the purposes of allocating resources, and does not consider there to be separable identifiable operating segments for which financial information can be presented.³²
49. EE's total expenditure (including operating and capital expenditure) on mobile backhaul for the year to 31 December 2014 was £[X]. This represents [X]% of EE's total costs for the year (£[X]).
50. Table 11 below shows EE's operational expenditure on copper and fibre mobile backhaul circuits for the last two financial years, split by supplier. The table also distinguishes between EE's share of the MBNL mobile backhaul expense, and that incurred by EE unilaterally.

³² EE Limited Annual Report Year ended 31 December 2014, p38, section 5.

Table 11: EE's backhaul expenditure for the two most recent financial years, split by supplier.

£m

	Supplier	EE unilateral		EE share of MBNL		Total
		Copper	Fibre	Copper	Fibre	
2014	[X]	[X]	[X]	[X]	[X]	[X]
	[X]	[X]	[X]	[X]	[X]	[X]
	[X]	[X]	[X]	[X]	[X]	[X]
	[X]	[X]	[X]	[X]	[X]	[X]
	[X]	[X]	[X]	[X]	[X]	[X]
2013	[X]	[X]	[X]	[X]	[X]	[X]
	[X]	[X]	[X]	[X]	[X]	[X]
	[X]	[X]	[X]	[X]	[X]	[X]
	[X]	[X]	[X]	[X]	[X]	[X]
	[X]	[X]	[X]	[X]	[X]	[X]

Source: EE.

51. EE does not have any backhaul costs related to its fixed operations – all of EE's retail fixed services are based on end-to-end wholesale fixed services procured from BT Wholesale.

Spectrum

52. In the most recent spectrum auction held by Ofcom in February 2013, EE invested £588.9 million on 2 x 5 MHz of 800 MHz and 2 x 35 MHz of 2.6 GHz. This purchase increased EE's total spectrum holding to 2 x 5 MHz of 800 MHz, 2 x 45 MHz of 1.8 GHz, 2 x 20 MHz of 2.1 GHz, and 2 x 35 MHz of 2.6 GHz.

Capital structure

53. At the end of 2014, the leverage ratio was 1.64x Net Debt to EBITDA.³³

Balance sheet

54. As at 31 December 2014, the group had total assets of £13,859 million (2013: £14,612 million), and total liabilities of £4,938 million (2013: £4,879 million).³⁴ Included in the group's total assets is £182 million (2013: £172 million), which is the Group's share of MBNL network assets.³⁵
55. As at 31 December 2014, EE's share of the MBNL joint arrangement's capital commitments was £31 million (2013: £26 million).

³³ EE Limited Annual Report Year ended 31 December 2014, p6, paragraph 12.

³⁴ EE Limited Annual Report Year ended 31 December 2014, p17.

³⁵ EE Limited Annual Report Year ended 31 December 2014, p52, paragraph 2.

Third parties

56. This section outlines the UK activities and high-level financial positions of a selection of third parties, which are relevant to the merger given the segments we are considering and the theories of harm. They comprise three MNOs (O2, Vodafone, H3G), three MVNOs³⁶ (Sky, TalkTalk, Virgin Media), and two backhaul providers (CityFibre, Zayo).
57. Also included is an outline of the two significant network sharing agreements considered as part of our investigation: MBNL, the joint venture between EE and H3G; and CITL, the joint venture between Vodafone and O2.

O2 (Telefónica)

58. Telefónica UK Limited (TUK), an indirect wholly-owned subsidiary of Telefónica S.A., primarily operates in the UK under the O2 commercial brand and provides a range of mobile communications services including voice, text and data connections via its 2G, 3G, 4G and Wi-Fi networks. Since 2009, TUK has also provided mobile communication services through its online-only sub-brand giffgaff, which it operates through its wholly-owned subsidiary giffgaff Limited.
59. In addition, TUK and Tesco Mobile Services Limited operate a 50:50 joint venture Tesco Mobile Limited (Tesco Mobile). Tesco Mobile is an MVNO that offers a range of mobile communication services on TUK's network under the Tesco Mobile brand. Tesco Mobile utilises Tesco plc's distribution network and customer base. Telefonica told us that Tesco Mobile is run on an arm's length basis from its two shareholders.
60. TUK is part of a network sharing joint venture with Vodafone UK, the passive sharing elements of which are operated by CTIL. See paragraph 112 for further information.
61. O2 has over 450 retail stores and sponsors The O2 Arena in London, O2 Academy venues and the England rugby team.
62. Table 12 is a summary of TUK's financial information for the two years to 31 March 2013.³⁷

³⁶ These companies are primarily BT's competitors in fixed services, and only secondarily in mobile services. In several instances BT's competitors are also customers of BT.

³⁷ Annual report for the year to December 2014 not yet available on Companies House.

Table 12: Telefonica UK Limited– summary financial information for year ended 31 December 2013

	<i>£m</i>		<i>%</i>
	<i>FY 2012</i>	<i>FY 2013</i>	<i>% change</i>
Revenue	5,609	5,535	-1.32
EBITDA	†	†	
Operating profit/EBIT	395	484	22.53
Loss before tax	489	609	24.54
Total assets	14,260	15,641	9.68
Total assets less current liabilities	11,172	12,206	9.26
Total liabilities	-3,200	-4,086	27.69
Total shareholder equity	11,060	11,555	4.48
EBITDA margin	†	†	
Gearing ratio*	28.9%	35.4%	

Source: [Telefonica UK Limited statutory accounts for the year ending 31 December 2013](#).

*Total liabilities/total equity.

†Not available.

63. Below is a summary of TUK's high-level financials for the year to 31 December 2014, with revenue split out by line of business.

Table 13: Summary of Telefonica UK Limited financial information for the year to 31 December 2014

	<i>£m</i>
<i>Line of business</i>	<i>Revenue</i>
Mobile	4,350
[X]	[X]
[X]	[X]
Total	5,691
EBITDA	1,405
[X]	[X]

Source: Telefónica.

64. Telefonica has provided us with its total UK revenue for the last two financial years and the latest three-month internal reporting period, split by retail and wholesale as follows.

Table 14: Telefonica's UK revenue for the two years to 31 December 2014, and the most recent three-month internal reporting period, split by retail and business

Revenue stream	FY 2014		FY 2013		3-month period	
	1 January – 31 December		1 January – 31 December		April – June 15	
	£m	% of total revenue	£m	% of total revenue	£m	% of total revenue
Retail consumer	[X]	[X]	[X]	[X]	[X]	[X]
Retail business – SME*	[X]	[X]	[X]	[X]	[X]	[X]
Retail business – Large enterprises	[X]	[X]	[X]	[X]	[X]	[X]
Retail business – Public sector	[X]	[X]	†	[X]	[X]	[X]
Total business	[X]	[X]	[X]	[X]	[X]	[X]
Wholesale	[X]	[X]	[X]	[X]	[X]	[X]
Other	[X]	[X]	[X]	[X]	[X]	[X]
Total	5,691	100	5,680	100	1,409	100

Source: Telefónica.

*A customer is allocated to the SME category if it is a mobile business customer with typically fewer than 2,000 employees.

†Public sector revenue information is not available for 2013 because the internal system to segment results was only built in 2014.

65. Taking the retail categories, Telefonica has further allocated the UK revenue by different products as follows:

Table 15: Telefonica's UK retail revenue for the two years to 31 December 2014, and the most recent three-month internal reporting period, split by product

Revenue stream	FY 2014		FY 2013		3-month period	
	1 January – 31 December		1 January – 31 December		April – June 15	
	£m	% of total revenue	£m	% of total revenue	£m	% of total revenue
Consumer						
Mobile – voice and messaging*	[X]	[X]	[X]	[X]	[X]	[X]
Mobile – data*	[X]	[X]	[X]	[X]	[X]	[X]
Mobile – handsets and accessories	[X]	[X]	[X]	[X]	[X]	[X]
Fixed – broadband	[X]	[X]	[X]	[X]	[X]	[X]
Other†	[X]	[X]	[X]	[X]	[X]	[X]
Total consumer	[X]	[X]	[X]	[X]	[X]	[X]
Business						
Mobile – voice and messaging*	[X]	[X]	[X]	[X]	[X]	[X]
Mobile – data*	[X]	[X]	[X]	[X]	[X]	[X]
Mobile – handsets and accessories	[X]	[X]	[X]	[X]	[X]	[X]
Fixed – broadband	[X]	[X]	[X]	[X]	[X]	[X]
Other‡	[X]	[X]	[X]	[X]	[X]	[X]
Total business	[X]	[X]	[X]	[X]	[X]	[X]

Source: Telefónica.

*Telefonica told us there is no 'one-size-fits-all' formula for the creation of line-rental or usage bundle price points, rather the price is determined by a number of factors including handset cost recover, competitor prices, voice/text/data allowances. An exercise was performed in 2013 to try to allocate subscription revenues to the product types in each segment; the estimates have not changed since then.

†The consumer 'other' category includes inbound roaming revenue and other non-mobile revenue.

‡The business 'other' category includes inbound roaming revenue, other non-mobile revenue, and wholesale discounts.

66. Table 16 below shows Telefonica's operational expenditure on copper and fibre backhaul circuits for the last two financial years, split by supplier.

Table 16: Telefonica’s mobile backhaul expenditure for the two most recent financial years, split by supplier

	<i>£m</i>	
<i>Supplier</i>	<i>FY 2014</i>	<i>FY 2013</i>
[X]	[X]	[X]
[X]	[X]	[X]
[X]	[X]	[X]
[X]	[X]	[X]

Source: Telefónica.

Vodafone

67. Vodafone is a UK-based publicly listed company. Its primary activities comprise the operation of mobile telecommunication networks and the provision of mobile telecommunication services, including voice telephony, messaging, data and content services. Some of its operating companies also provide fixed line telephony, broadband Internet access and IPTV services.
68. Vodafone Limited is a UK subsidiary of the Vodafone Group. Vodafone Limited does not represent the whole of Vodafone’s operations in the UK but is the largest of the UK subsidiaries. Table 17 is a summary of Vodafone Limited’s financial information for the two years to 31 March 2014.

Table 17: Vodafone Limited – summary financial information for the year ended 31 March 2014

	<i>£m</i>		<i>%</i>
	<i>FY 2013</i>	<i>FY 2014</i>	<i>% change</i>
Revenue	5,063	6,969	37.65%
EBITDA	†	†	†
Operating profit/EBIT	135	5.9	-95.63
Loss before tax	-184	-305	65.76%
Total assets	14,034	13,226	-5.76%
Total assets less current liabilities	9,458	8,901	-5.89%
Total liabilities	-11,370	-11,003	-3.23%
Total shareholder equity	2,664	2,223	-16.55%
EBITDA margin	†	†	
Gearing ratio*	426.8%	495%	

Source: [Vodafone Limited statutory accounts for the year ending 31 March 2014](#), pp10 & 12.

*Total liabilities/total equity.

†Not available.

69. Table 18 is a summary of Vodafone’s high-level financials for all UK operations in the year to 31 March 2015, with revenue split out by line of business.

Table 18: Summary of Vodafone UK financial information for the year to 31 March 2015

<i>£m</i>	
<i>Line of business</i>	<i>Revenue</i>
Mobile	4,472
Fixed	1,637
Other	305
Total	6,414
EBITDA	1,360
EBIT	41

Source: [Vodafone results for the year ended 31 March 2015](#).

70. Vodafone has provided us with its total UK revenue for the last two financial years and the latest three-month internal reporting period, split by retail and wholesale as follows.

Table 19: Vodafone's UK revenue for the two years to 31 March 2015, and the most recent three-month internal reporting period, split by retail and business

<i>Revenue stream</i>	<i>FY 2015</i>		<i>FY 2014</i>		<i>3-month period</i>	
	<i>April 14 - March 15</i>		<i>April 13 - March 14</i>			
	<i>£m</i>	<i>% of total revenue</i>	<i>£m</i>	<i>% of total revenue</i>	<i>£m</i>	<i>% of total revenue</i>
[X]	[X]	[X]	[X]	[X]	[X]	[X]
[X]	[X]	[X]	[X]	[X]	[X]	[X]
[X]	[X]	[X]	[X]	[X]	[X]	[X]
[X]	[X]	[X]	[X]	[X]	[X]	[X]
[X]	[X]	[X]	[X]	[X]	[X]	[X]
[X]	[X]	[X]	[X]	[X]	[X]	[X]
[X]	[X]	[X]	[X]	[X]	[X]	[X]
[X]	[X]	[X]	[X]	[X]	[X]	[X]
[X]	[X]	[X]	[X]	[X]	[X]	[X]

Source: [X]
[X]

71. Taking the retail categories, Vodafone has further allocated the UK revenue by different products as follows.

74. H3G offers mobile services including voice, SMS, MMS, mobile internet and mobile broadband, but does not have any fixed-line, Wi-Fi or TV offerings. H3G also provides wholesale access and call origination services to MVNOs. H3G currently operates 3G and 4G networks and has 800MHz, 1800MHz and 2.1GHz spectrum.

75. Table 22 is a summary of H3G's financial information.

Table 22: Hutchison 3G UK Limited – summary financial information for year ended 31 December 2013

	£m		% change
	FY 2012	FY 2013	
Revenue*	1,978	2,049	3.6
EBITDA	252	391	55.2
Operating profit/EBIT	93	195	109.7
Profit before tax	48	166	245.8
Total assets	6,470	7,008	8.3
Total assets less current liabilities	945	1,293	36.8
Total liabilities	-12,349	-12,560	1.7
Total shareholder deficit	-5,946	-5,609	-5.7
EBITDA margin	12.7%	19.1%	
Gearing ratio†	‡	‡	

Source: [Hutchison 3G UK Limited statutory accounts for the year ended 31 December 2013](#).

*Turnover + other operating income.

†Total liabilities/total equity.

‡Not applicable.

76. H3G has provided us with its total UK revenue for the last two financial years and the latest three-month internal reporting period, split by retail and wholesale as follows.

Table 23: H3G's UK revenue for the two years to 31 March 2015, and the most recent three-month internal reporting period, split by retail and business

Revenue stream	FY 2015		FY 2014		3-month period	
	April 14 - March 15		April 13 - March 14		April - June 15	
	£m	% of total revenue	£m	% of total revenue	£m	% of total revenue
Retail consumer	[x]	[x]	[x]	[x]	[x]	[x]
Retail business*	[x]	[x]	[x]	[x]	[x]	[x]
Wholesale	[x]	[x]	[x]	[x]	[x]	[x]
Other†	[x]	[x]	[x]	[x]	[x]	[x]
Total	[x]	[x]	[x]	[x]	[x]	[x]

Source: H3G

*[x]

†[x]

77. Taking the retail categories, H3G has further allocated the UK revenue by different products as follows.

Table 24: H3G's UK retail revenue for the two years to 31 March 2015, and the most recent three-month internal reporting period, split by product

Revenue stream	FY 2015		FY 2014		3 month period	
	April 14 – March 15		April 13 – March 14		April – June 15	
	£m	% of total revenue	£m	% of total revenue	£m	% of total revenue
<i>Consumer</i>						
Mobile - bundles services	[X]	[X]	[X]	[X]	[X]	[X]
Mobile - voice and messaging	[X]	[X]	[X]	[X]	[X]	[X]
Mobile - data	[X]	[X]	[X]	[X]	[X]	[X]
Mobile - handsets and accessories	[X]	[X]	[X]	[X]	[X]	[X]
Other*	[X]	[X]	[X]	[X]	[X]	[X]
Total consumer	[X]	[X]	[X]	[X]	[X]	[X]
<i>Business</i>						
Mobile - bundled services†	[X]	[X]	[X]	[X]	[X]	[X]
Mobile - voice and messaging	[X]	[X]	[X]	[X]	[X]	[X]
Mobile - data	[X]	[X]	[X]	[X]	[X]	[X]
Other	[X]	[X]	[X]	[X]	[X]	[X]
Total business	[X]	[X]	[X]	[X]	[X]	[X]

Source: H3G

*[X]

†[X]

78. Table 25 below shows H3G's operational expenditure on fibre mobile backhaul circuits for the last two financial years, split by supplier.

Table 25: H3G's mobile backhaul expenditure for the two most recent financial years, split by supplier

Supplier	£m	
	2015	2014
BT Wholesale	[X]	[X]
Virgin Media	[X]	[X]
Self-provision	[X]	[X]
Total	[X]	[X]
% of operating expenses	[X]	[X]

Source: H3G.

79. H3G acquires a managed backhaul service from BT Wholesale and Virgin Media, and self-supplies microwave links. H3G does not provide fixed lines [X].

Sky

80. Sky plc (Sky) is a home entertainment and communications provider that offers pay television services, broadband and telephony services. Sky operates in the UK, Ireland, Germany, Austria, and Italy.³⁸ Sky's main activities include the retail of pay TV and communication services and the creation and assembly of TV content for retail and wholesale.

³⁸ MarketLine Industry Profile (February 2015), Telecommunications services in the United Kingdom, p25.

81. Sky's retail business in the UK and Ireland is engaged in the provision of pay TV services to residential and commercial premises, and communications services to residential premises. Sky owns and broadcasts the Sky Channels, which it retails together with many other broadcasters' channels, and operates a number of businesses in adjacent sectors including Sky Media, Sky Business, Sky Bet, and Sky Vision.³⁹
82. Sky's communications services include Sky Broadband and its fixed telephony services, which operate under the brand name of Sky Talk. Sky offers wireless fidelity (Wi-Fi) Internet access through Sky Wi-Fi and operates over 20,000 public access hotspots across the UK.⁴⁰
83. In its response to the market questionnaire, Sky provided financial data on its UK telecoms business for its most recent financial year (1 July 2014 to 30 June 2015). It noted, however, that the figures provided were actual figures for months 1-11, but month 12 figures were forecasts based on the month 1-11 results.
84. [REDACTED]:⁴¹
- (a) [REDACTED]
- (b) [REDACTED]
- (c) [REDACTED]
85. Table 26 below shows a summary of Sky's financial information for its entire business in the UK.

Table 26: British Sky Broadcasting Group plc – summary of financial information for year ended 30 June 2014

	<i>£m</i>		
	<i>FY 2013</i>	<i>FY 2014</i>	<i>% change</i>
Revenue	7,235	7,632	5.5
EBITDA	1,669	1,597	-1.5
Operating profit/EBIT	1,291	1,161	-10.1
Profit before tax	1,257	1,082	-13.9
Total assets	6,345	6,449	1.6
Total assets less current liabilities	4,028	3,930	2.4
Total liabilities	(5,333)	(5,337)	0.1
Total shareholder equity	1,012	1,072	5.9
EBITDA margins	23.4%	21.8%	
Gearing ratio*	527%	498%	

Source: [BskyB annual report 2014](#).

³⁹ Sky wholesales its channels to third-party pay TV platforms, as well as selling a wide range of programming internationally through Sky Vision.

⁴⁰ [MarketLine Industry Profile \(February 2015\), Telecommunications services in the United Kingdom](#), p25.

⁴¹ [REDACTED]

*Total liabilities/total equity.

86. Sky has provided us with its total UK revenue for the last two financial years and the latest three-month internal reporting period, split by retail and wholesale as follows.

Table 27: Sky's UK revenue for the two years to 30 June 2015, and the most recent three-month internal reporting period, split by retail and business

[REDACTED]

Source: [REDACTED]

[REDACTED]

87. Taking the retail categories, Sky has further allocated the UK revenue by different products as follows.

Table 28: Sky's UK retail revenue for the two years to 30 June 2015, and the most recent three-month internal reporting period, split by product

[REDACTED]

Source: [REDACTED]

[REDACTED]

88. Table 29 below shows Sky's operational expenditure on fibre mobile backhaul circuits for the last two financial years, split by supplier.

Table 29: Sky's mobile backhaul expenditure for the two most recent financial years, split by supplier

	<i>£m</i>	
	<i>Supplier</i>	<i>Total</i>
2014/15	[REDACTED]	[REDACTED]
	[REDACTED]	[REDACTED]
	[REDACTED]	[REDACTED]
2013/14	[REDACTED]	[REDACTED]
	[REDACTED]	[REDACTED]
	[REDACTED]	[REDACTED]

Source: [REDACTED]

89. [REDACTED]

TalkTalk

90. TalkTalk Telecom Group (TalkTalk) is a UK-based broadband and voice provider. The TalkTalk Group includes five subsidiary undertakings, which are TalkTalk Group Limited, TalkTalk Telecom Holdings Limited, TalkTalk Communications Limited, TalkTalk Telecom Limited and CPW Network Services Limited. All holdings are in equity share capital and give the Group an effective holding of 100% on consolidation.⁴²

⁴² TalkTalk Group Annual Report 2015, p76.

91. TalkTalk offers three customer propositions. These are:
- (a) SimplyBroadband, which offers unlimited broadband without inclusive landline calls;
 - (b) Essentials TV, which provides a range of broadband, television and phone services; and
 - (c) Plus TV, which offers broadband, phone and television services for customers who want an unlimited package.
92. The company currently serves around 4 million residential and business customers under the brand names, TalkTalk and TalkTalk Business.⁴³ TalkTalk's residential packages offer broadband, phone, television and mobile services. TalkTalk Business supplies voice and data services to the small and medium sized enterprise market and serves over 180,000 customers and 350 partners.
93. Table 30 provides an overview of the TalkTalk Telecom Group's financial information for the last two financial years.

Table 30: TalkTalk Telecom Group plc – summary financial information for the year ended 31 March 2015

	<i>£m</i>		
	<i>FY 2014</i>	<i>FY 2015</i>	<i>% change</i>
Revenue	1,722	1,795	4.3
EBITDA	213	245	15
Operating profit/EBIT	51	54	5.9
Profit before tax	31	32	3.2
Total assets	1,323	1,463	10.6
Total assets less current liabilities	814	913	12.1
Total liabilities	(976)	(1,166)	19.5
Total shareholder equity	347	297	(14.4)
EBITDA margin	12.3%	13.6%	
Gearing ratio*	281%	393%	

Source: [TalkTalk Telecom Group plc – statutory accounts for the year ending 31 March 2015](#).

*Total liabilities/total equity.

94. TalkTalk has provided us with their revenue for the last two financial years and the latest three-month internal reporting period, split by retail and wholesale as follows.

⁴³ TalkTalk Telecom Group company profile, MarketLine, October 2014.

Table 31: TalkTalk's revenue for the two years to 31 March 2015, and the most recent three-month internal reporting period, split by retail and business

Revenue stream	FY 2015		FY 2014		3-month period	
	April 14 - March 15		April 13 - March 14			
	£m	% of total revenue	£m	% of total revenue	£m	% of total revenue
Retail consumer	[X]	[X]	[X]	[X]	[X]	[X]
Retail business - SME*	[X]	[X]	[X]	[X]	[X]	[X]
Retail business - Large enterprises†	[X]	[X]	[X]	[X]	[X]	[X]
Retail business - Government‡	[X]	[X]	[X]	[X]	[X]	[X]
Total business	[X]	[X]	[X]	[X]	[X]	[X]
Wholesale	[X]	[X]	[X]	[X]	[X]	[X]
Other‡	[X]	[X]	[X]	[X]	[X]	[X]
Total	[X]	[X]	[X]	[X]	[X]	[X]

Source: TalkTalk.

*The 'SME' category includes all business customers whose companies have between 20 and 250 employees.

†TalkTalk does not report large enterprises and government revenue separately, this revenue is included in the 'other' category.

‡Included in 'other' is revenue from large business, government, advertising, AOL revenue share and termination fees.

95. In the year to 31 March 2015 TalkTalk spent £[X] on fixed backhaul services (£[X] in 2014). These were provided by the following.

Table 32: TalkTalk's backhaul expenditure for the two most recent financial years, split by supplier

Supplier	£'000	
	2014/15	2013/14
BT Openreach	[X]	[X]
Virgin Media	[X]	[X]
Eircom	[X]	[X]
Total	[X]	[X]
% of operating expenses	[X]	[X]
Operating expenses	[X]	[X]

Source: TalkTalk.

Virgin Media

96. Virgin Media Limited (Virgin Media) is a wholly-owned subsidiary of Liberty Global plc, which came into being as a result of a series of mergers that were completed on 7 June 2013.⁴⁴

97. Virgin Media is an entertainment and communications business which provides fixed line telephony, mobile telephony, broadband and TV services to residential and (in relation to some services) business customers in the UK. Virgin Media owns and operates a cable network that, as of 31 December 2014, passed approximately 12.6 million addressable homes in the UK and provides services to approximately 4.5 million cable broadband customers.⁴⁵

⁴⁴ Virgin Media (March 2015), [Consolidated Financial Statements December 31, 2014 and 2013](#), p5.

⁴⁵ [Virgin Media initial submission](#), p2.

Table 33: Virgin Media Inc – summary financial information for year ended 31 December 2014

	<i>£m</i>		<i>% change</i>
	<i>FY 2013</i>	<i>FY 2014</i>	
Revenue	*	4,214	*
EBITDA equivalent†	*	1,776	*
Operating profit/EBIT	*	220	*
Profit before tax	*	(89.1)	*
Total assets	19,311	18,982	(1.7)%
Total assets less current liabilities	17,775	17,203	(3.2)%
Total liabilities	(10,283)	(10,407)	1.2%
Total shareholder equity	9,028	8,575	(5)%
EBITDA margin equivalent‡	*	42.1%	
Gearing§	114%	121%	

Source: [Virgin Media Inc. statutory accounts for the year ending 31 December 2014](#).

*Not directly available.

†This is operating income before depreciation and amortisation. Virgin Media Inc operates under US GAAP rather than IFRS, this is the closest measure to EBITDA as Virgin Media could provide.

‡This is operating income before depreciation and amortisation/revenue.

§Total liabilities/total equity.

98. Virgin Media has provided us with its total UK revenue for the last two financial years and the latest three-month internal reporting period, split by retail and wholesale as follows.

Table 34: Virgin Media's UK revenue for the two years to 31 December 2014, and the most recent three-month internal reporting period, split by retail and business

<i>Category</i>	<i>FY 2013</i>		<i>FY 2014</i>		<i>3-month period</i>	
	<i>1 January - 31 December</i>		<i>1 January - 31 December</i>		<i>April - June 15</i>	
	<i>£m</i>	<i>% of total revenue</i>	<i>£m</i>	<i>% of total revenue</i>	<i>£m</i>	<i>% of total revenue</i>
Retail consumer	[x]	[x]	[x]	[x]	[x]	[x]
Retail business - SME*	[x]	[x]	[x]	[x]	[x]	[x]
Retail business - Large enterprises*	[x]	[x]	[x]	[x]	[x]	[x]
Retail business - Government*	[x]	[x]	[x]	[x]	[x]	[x]
Total business	[x]	[x]	[x]	[x]	[x]	[x]
Wholesale*	[x]	[x]	[x]	[x]	[x]	[x]
Other†	[x]	[x]	[x]	[x]	[x]	[x]
Total	[x]	100	4,214	100	[x]	100

Source: Virgin Media.

*It is important to note that these figures are not reported figures. These have been calculated using the approximate percentage splits provided by Virgin Media of the contribution to revenue of the various business and wholesale categories, which are ordinarily reported together as one figure.

†The 'other' category comprises carriage and interconnect revenue, offnet revenue, and miscellaneous revenue (eg early termination fees and late payment fees).

99. Taking the consumer retail category, Virgin Media has further allocated the UK revenue by different products as follows.

Table 35: Virgin Media's UK consumer retail revenue for the two years to 31 December 2014, and the most recent three-month internal reporting period, split by product

Revenue stream	FY 2013		FY 2014		3-month period	
	1 January - 31 December		1 January - 31 December		April - June 15	
	£m	% of total revenue	£m	% of total revenue	£m	% of total revenue
Mobile - voice and messaging	[X]	[X]	[X]	[X]	[X]	[X]
Mobile - data	[X]	[X]	[X]	[X]	[X]	[X]
Mobile - handsets & accessories	[X]	[X]	[X]	[X]	[X]	[X]
Fixed - voice	[X]	[X]	[X]	[X]	[X]	
Fixed - broadband	[X]	[X]	[X]	[X]	[X]	
TV	[X]	[X]	[X]	[X]	[X]	
Total consumer	[X]	100	[X]	100	[X]	100

Source: Virgin Media.
*Unavailable.

100. Virgin Media uses its own network to provide mobile backhaul to mobile operators; it does not purchase any managed or unmanaged mobile backhaul products from BT. However, when an MNO's core network access point is located within a BT exchange, Virgin Media purchases a Cablelink product from BT Openreach to connect the MNO network with Virgin Media's mobile backhaul solution, which is outside of the BT exchange. In 2014, Virgin Media spent £[X] on Cablelink for the provision of mobile backhaul to its wholesale customers.

CityFibre

101. CityFibre Infrastructure Holdings plc. (CityFibre) is an investor, builder and operator of fibre-optic local access networks in towns and cities outside London. Founded in 2011, the company has raised over £60m to date. In January 2014, CityFibre listed on the AiM market of the London Stock Exchange.⁴⁶

102. CityFibre is a wholesale only operator. Communications providers and MNOs use CityFibre's open access fibre infrastructure to deliver digital communications to their customers. Its fibre-optic infrastructure provides connectivity to mobile sites, public services, business and homes.

⁴⁶ CityFibre initial submission, p3, paragraph 1.

Table 36: CityFibre Infrastructure Holdings plc – summary financial information for year ended 31 December 2014

	<i>£m</i>		
	<i>FY 2013</i>	<i>FY 2014</i>	<i>% change</i>
Revenue	1,874	3,844	105.1
EBITDA	-2,998	-5,943	98.2
Operating profit/EBIT	-4,204	-7,450	77.2
Profit before tax	-6,318	-7,057	11.7
Total assets	21,664	70,149	223.8
Total assets less current liabilities	2,141	62,206	2,805.5
Total liabilities	-22,629	-20,286	-10.4
Total shareholder equity	-965	49,863	
EBITDA margin	-160%	-154.6%	
Gearing ratio*	†	41%	

Source: CityFibre (2014), [Annual Report 2014](#).

*Total liabilities/total equity.

†Not available.

103. On 13 November 2014, CityFibre entered into a national framework agreement with MBNL and its MNO shareholders, EE and H3G.⁴⁷ CityFibre told us this agreement was established to enable mobile backhaul delivery via dark fibre connections to EE and H3G sites in many urban locations, starting with Hull.

Zayo

104. Zayo Group UK Limited's (Zayo) ultimate parent undertaking is Zayo Group Holdings Inc., a company incorporated in the United States of America.⁴⁸ Zayo Group Holdings Inc. is a global provider of bandwidth infrastructure services, including dark fibre.

105. Zayo's UK fibre optic network spans more than 450,000km and connects over 130 data centres via unique routes alongside the national gas pipeline and within London's sewer system. According to Zayo, this provides customers with added security and reliability for mission critical data as well as diversity from other connectivity providers in the region.

106. Zayo leases fibre and services from other telecommunication providers in order to provide services to its customers. These contracts tend to be long term, which limits the company's exposure to unfavourable increases in price.⁴⁹

107. Table 37 provides an overview of Zayo's financial information for its last two reported financial years. During FY 13, Zayo changed its fiscal year end to 30

⁴⁷ [CityFibre initial submission](#), p6, paragraph 5.

⁴⁸ [Zayo Group UK Limited, statutory accounts for the year ended 30 June 2014](#), p21.

⁴⁹ [Zayo Group UK Limited statutory accounts for year ended 30 June 2014](#), p2.

June from 31 December; the results for the period ended 30 June 2013 are derived from the 18 month period ended 30 June 2013.⁵⁰ Annualised FY 13 have been provided wherever possible. While Zayo's gearing ratio increased from FY 13 to FY 14, Zayo reported that it had no long term debt other than that owed to its parent undertaking.⁵¹

Table 37: Zayo Group UK Limited – summary financial information for year ended 30 June 2014

	£'000			
	FY 2013	Annualised FY 2013	FY 2014	% change*
Revenue	53,212	35,475	38,068	7.3
Gross profit	37,162	24,775	28,241	14
EBITDA	21,956	†	6,562	†
Operating profit/EBIT	15,469	10,313	1,721	-83.3
Profit before tax	15,498	†	1,796	†
Total assets	51,240	51,240	66,754	30.3
Total assets less current liabilities	44,785	44,785	58,860	31.4
Total liabilities	-9,632	-9,632	-27,188	182.3
Total shareholder equity	41,608	41,608	39,566	-4.9
EBITDA margin	41.3%		17.2%	
Gearing ratio‡	23%	23%	69%	

Source: [Zayo Group UK Limited statutory accounts for the year ended 30 June 2014](#).

*Against annualised.

†Not available.

‡Total liabilities/total equity.

MBNL

108. As mentioned in paragraph 23, EE has a 50% share in Mobile Broadband Network Limited (MBNL), a network sharing joint venture with H3G. Outside MBNL, EE and H3G operate their own core networks, retain their own spectrum licences and compete at a retail level.
109. MBNL is responsible for operationally managing the RAN (2G, 3G, LTE) and other shared site infrastructure supporting the networks of the two parties on an ongoing basis. It also acquires certain assets relevant to the shared network, and manages network and operational services in respect of both the shared network and unilateral deployment (ie network assets or services specific to either EE or H3G).
110. MBNL purchases backhaul services for the shared EE/H3G radio access network (RAN). These backhaul services link radio base station sites to EE/H3G's respective core networks through: (a) microwave (radio) backhaul circuits; and (b) fixed leased line backhaul circuits from fixed network providers. The majority of circuits use fibre, however there are legacy circuits

⁵⁰ [Zayo Group UK Limited, Statutory accounts for year ended 30 June 2014](#), p4.

⁵¹ Zayo is therefore not exposed to market fluctuations in interest rates and the related cash flow requirements to service this debt.

which rely on copper for certain locations, for example where there is no existing fibre network in proximity to the radio site.

Table 38: MBNL backhaul network by physical medium used as of December 2014

Number of circuits serviced by:

[X]	[X]	[X]	[X]
[X]	[X]	[X]	[X]
[X]	[X]	[X]	[X]
[X]	[X]	[X]	[X]

Source: [X]
[X]

- 111. Backhaul from the remainder of the MBNL managed radio sites is provided through microwave circuits.

CTIL

- 112. In October 2012, Vodafone UK and TUK established a network sharing joint venture, Cornerstone Telecommunications Infrastructure Limited (CTIL). The purpose was to combine their respective site grids to achieve a single grid of shared sites and to engage in active sharing of RAN assets and access transmission links for 2G, 3G and 4G mobile network traffic (except in London where only 4G technologies are shared).

Figure 5: Illustration of contractual agreements regarding the CTIL joint venture between Vodafone and TUK

[X]

- 113. Responsibility for active RAN assets, including network service levels, and access transmission in the UK is split between the parties (see the illustrative map in Figure 6 below).
- 114. Each party manages the cost and financing of deploying, operating and maintaining the active RAN assets in its respective region and CTIL manages the cost and financing of deploying, operating and maintaining passive RAN assets in the combined network across the UK.

Figure 6: The division of responsibility for active RAN assets between TUK and Vodafone

[X]

Source: [X]
[X]

- 115. [X]

Spectrum holdings

116. The most recent Ofcom auction for spectrum was held in February 2013 and resulted in the following purchases.

Table 39: Spectrum purchases resulting from the 2013 Ofcom spectrum auction

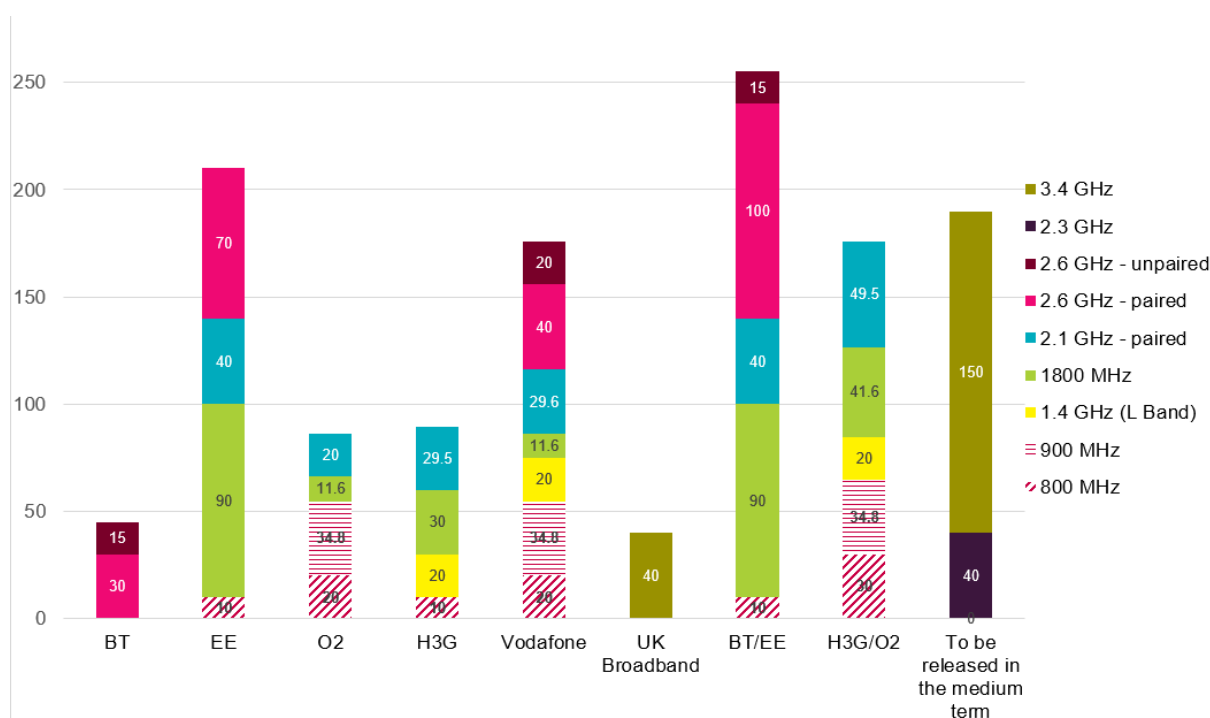
Winning bidder	Spectrum won	Base price
Everything Everywhere Ltd	2 x 5 MHz of 800 MHz and 2 x 35 MHz of 2.6 GHz	£588,876,000
Hutchison 3G UK Ltd	2 x 5 MHz of 800 MHz	£225,000,000
Niche Spectrum Ventures Ltd*	2 x 15 MHz of 2.6 GHz and 1 x 20 MHz of 2.6 GHz (unpaired)	£186,476,000
Telefónica UK Ltd	2 x 10 MHz of 800 MHz (coverage obligation lot)	£550,000,000
Vodafone Ltd	2 x 10 MHz of 800 MHz, 2 x 20 MHz of 2.6 GHz and 1 x 25 MHz of 2.6 GHz (unpaired)	£790,761,000
Total		£2,341,113,000

Source: Ofcom (2013), 'Ofcom announces winners of the 4G mobile auction'.

*Subsidiary of BT Group plc.

117. Following these purchases, the total holdings by MNOs (plus UK Broadband and BT) was as shown by the graph below.

Figure 7: The total spectrum held by the UK MNOs, UK Broadband, and BT, with indication as to the type of spectrum held



Source: CMA.

118. There was a subsequent sale of 1.4 GHz spectrum by Qualcomm in August 2015. The result of this was 20 MHz of the 1.4 GHz spectrum sold to each of Vodafone and H3G.⁵² This sale is subject to Ofcom approval and other customary closing conditions.

⁵² Reuters website, 'Qualcomm to sell L-Band UK spectrum to Vodafone, Hutchison'.

Annex 1: Main party structural information

Table 1: BT Group plc entities (UK only), organised by line of business

<i>Company</i>	<i>Country</i>	<i>Line of business</i>	<i>Holding</i>
			%
BT Directories Limited	UK	BT Business	100
BT Fleet Limited	UK	BT Business	100
BT Fresca Limited	UK	BT Business	100
BT IT Services Limited	UK	BT Business	100
BT OnePhone Limited	UK	BT Business	70
dabs.com plc	UK	BT Business	100
Tikit Limited	UK	BT Business	100
Transcomm UK Limited	UK	BT Business	100
Plusnet plc	UK	BT Consumer	100
Youview TV Limited	UK	BT Consumer	14.29
BT Lancashire Services Limited	UK	BT Global Services	100
BT Solutions Limited	UK	BT Global Services	100
International Cable Protection Committee Limited	UK	BT Global Services	33.33
Psnbg Limited	UK	BT Global Services	4.5
Radianz Limited	UK	BT Global Services	100
BT Group Investments Limited	UK	BT Group Functions	100
British Telecommunications plc	UK	BT Group Functions	100
Autumnwindow Limited	UK	BT Group Functions	100
Autumnwindow No.3 Limited	UK	BT Group Functions	100
BT (RRS LP) Limited	UK	BT Group Functions	100
BT Cables Limited	UK	BT Group Functions	100
BT Centre Nominee 2 Limited	UK	BT Group Functions	100
BT Corporate Trustee Limited	UK	BT Group Functions	100
BT European Investments Limited	UK	BT Group Functions	100
BT Facilities Services Limited	UK	BT Group Functions	100
BT Holdings Limited	UK	BT Group Functions	100
BT Law Limited	UK	BT Group Functions	100
BT Nominees Limited	UK	BT Group Functions	100
BT Payment Services Limited	UK	BT Group Functions	100
BT Property Limited	UK	BT Group Functions	100
BT Sle Euro Limited	UK	BT Group Functions	100
BT Sle USD Limited	UK	BT Group Functions	100
Collectively Limited	UK	BT Group Functions	20
groupBT Limited	UK	BT Group Functions	40.95
Holland House (Northern) Limited	UK	BT Group Functions	100
Internet Matters Limited	UK	BT Group Functions	25
Manchester Communication Academy	UK	BT Group Functions	33.33
Manchester Communication Primary Academy	UK	BT Group Functions	50
Newgate Leasing Limited	UK	BT Group Functions	100
NICC Standards Limited	UK	BT Group Functions	33
Southgate Developments Limited	UK	BT Group Functions	99
BT Group Nominees Limited	UK	BT Group Functions	100
Autumnwindow No.2 Limited	UK	BT TSO	100
BTextact Technologies Limited	UK	BT TSO	100
BTextact Venturing Limited	UK	BT TSO	100
Subsea Cables UK	UK	BT TSO	2.27
BT Managed Services Limited	UK	BT Wholesale	100
NJUG Limited	UK	BT Wholesale	12.5

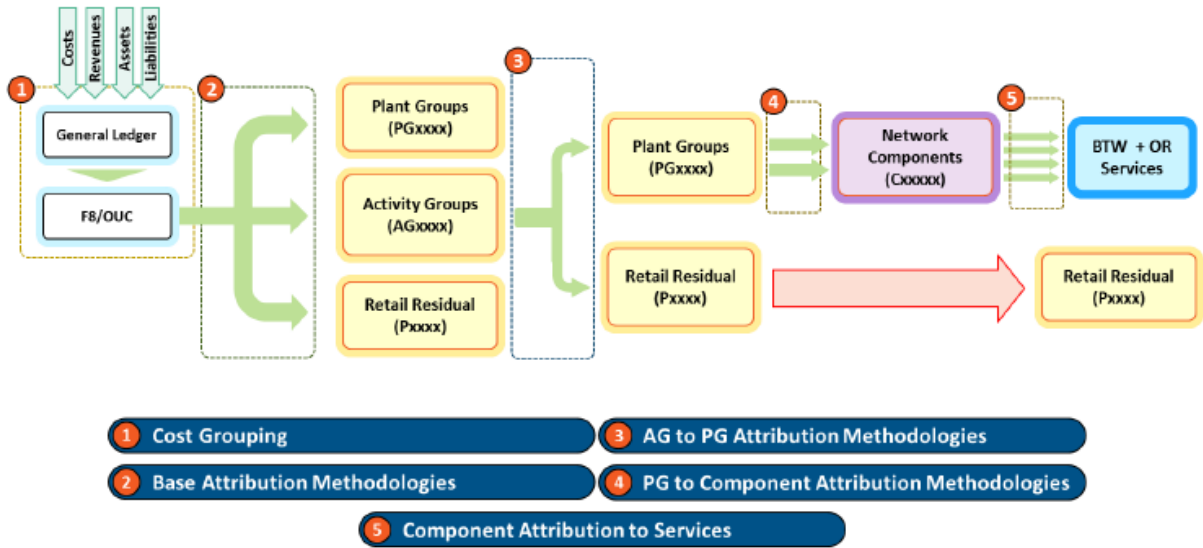
Source: Parties

Figure 1: EE group structure chart as at 31 December 2014



Source: Parties

Figure 2: Illustration of BT group cost allocation process



Source: Ofcom (June 2015), [BT Cost Attribution Review](#), p27.

Regulation

Introduction

1. This appendix outlines the regulatory framework relevant to the anticipated acquisition by BT of EE (together the parties). This paper therefore provides an overview of the regulation that is pertinent to the issues identified in this inquiry in accordance with the issues statement and relevant theories of harm working papers.¹ It is not intended to be a comprehensive description of every piece of regulation which applies to the parties.

Scope

2. Given the lines of inquiry identified in the issues statement, the main focus of this appendix is to provide an overview of the overall regulatory framework, as well as the regulation which applies to:
 - (a) Ofcom's market review obligations and SMP findings;
 - (b) BT's 2005 Undertakings, including the functional separation of Openreach from the rest of BT,² the Equivalence of Inputs (EoI) obligation and the Statement of Requirements (SoR) process;
 - (c) Ofcom's dispute resolution powers;
 - (d) Spectrum;
 - (e) Mobile backhaul/business connectivity;
 - (f) Wholesale Local Access (WLA) and Wholesale Broadband Access (WBA); and
 - (g) wholesale and retail mobile markets.

Overall regulatory framework

3. Communications networks and services are regulated in the UK by Ofcom. Its powers to do so derive from a number of different legal instruments, notably

¹ [Issues statement](#) (17 July 2015).

² Section 5.48 of the [Undertakings](#) require that BT maintains a separate brand for its access services line of business. Section 5.48 states that 'BT shall develop a separate brand name for AS which does not incorporate the elements 'BT' or 'British Telecom' and which will be used in proximity to an endorsement containing the words "a BT Group business (and BT corporate device)". Such endorsement shall be secondary to the AS brand'.

the Communications Act 2003 (CA03) and the European Regulatory Framework that underpins many of the provisions of the CA03. Ofcom therefore exercises its various functions within the framework harmonised across the EU for the regulation of electronic communications by the member states, known as the Common Regulatory Framework (CRF), as transposed by the CA03. The applicable rules are contained in a package of Directives, including the following:³

- (a) Directive (2002/21/EC) on a common regulatory framework for electronic communications networks and services (Framework Directive).
 - (b) Directive (2002/19/EC) on access to and interconnection of electronic communications networks and associated facilities (Access Directive).
 - (c) Directive (2002/20/EC) on the authorisation of electronic communications networks and services (Authorisation Directive).
4. Ofcom also has concurrent competition powers with the CMA under the Competition Act 1998 and the Enterprise Act 2002 (EA02).⁴
 5. Section 3(1) of CA03 outlines that Ofcom's principal duty in carrying out its 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'.
 6. In doing so, Ofcom is required to secure a number of specific objectives⁵ and to have regard to certain matters, such as, transparency, accountability and proportionality⁶ also outlined in section 3 CA03.
 7. Ofcom submitted that:

The legal instruments and regulatory powers which are most relevant to the BT/EE merger are those that relate to Ofcom's

³ The Directives were subsequently amended on 19 December 2009. The amendments have been transposed into the national legislation and applied with effect from 26 May 2011 and any references in this document to the CA03 should be read accordingly. See [BCMR 2013](#), Annex 2, regulatory framework; see [FAMR 2014](#), Annex 1, regulatory framework.

⁴ See [CMA and Ofcom memorandum of understanding](#), (17 June 2014).

⁵ Section 3(2), (including 'the optimal use for wireless telegraphy of the electro-magnetic spectrum' (section 3(2)(a)) and 'the availability throughout the United Kingdom of a wide range of electronic communications services' (section (3)(2)(b)).

⁶ S3(3)–(5) CA03; Ofcom is required to have regard to regulatory principles including transparency, accountability and proportionality and to a list of considerations to be taken into account when relevant, including the desirability of 'promoting competition in relevant markets', 'promoting and facilitating the development and use of effective forms of self-regulation', 'encouraging investment and innovation in relevant markets', 'encouraging the availability and use of high speed data transfer services throughout the United Kingdom' and 'the different needs and interests of [all users]... of the electro-magnetic spectrum'. It is also required to have regard, in particular, to the interests of consumers in respect of choice, price, quality of service and value for money.

market review functions and the regulatory conditions that we have imposed through the exercise of these functions, and the undertakings that were given by BT to Ofcom under section 154 of the Enterprise Act 2002 and that apply to BT's Openreach business. Many of the competition issues that are potentially raised by the BT/EE merger are either covered by the existing regulatory measures we have taken or fall within the scope of these regulatory powers.⁷

Other regulatory powers

8. Ofcom informed us that under the Authorisation Directive, member states were required to ensure the freedom to provide electronic communications networks and services. Further, the provision of such networks and services may only be subject to a general authorisation (as opposed to the obtaining of an individual licence or other authorisation before being able to provide an electronic communications network or service). The general authorisation may only be subject to the conditions which are specified in the Annex to the Authorisation Directive. These cover a range of matters, notably the obligation to negotiate interconnection with other communications providers (CPs) under the Access Directive and consumer protection rules (including measures to ensure the transparency of services and consumer contracts under the Universal Service Directive). There are currently 23 General Conditions which Ofcom has set under its powers in Part 2 CA03 and which apply either generally to all communications providers or to a class of communications provider.⁸
9. Ofcom said it was also involved in giving consumers access to information such as monitoring and reporting on mobile coverage and speeds by operator.⁹ These were strengthened by measures to allow consumers to assess and act on information. For example, for consumer broadband markets, Ofcom had introduced a voluntary Code of Practice for internet service providers under which they agreed to enable consumers to leave their broadband contract when speeds fell below specified levels.¹⁰
10. Ofcom also has functions in relation to the licensing of spectrum under the Wireless Telegraphy Act 2006.¹¹ Ofcom submitted that the exercise of these

⁷ [Ofcom response to issues statement](#), paragraph 2.3.

⁸ [Ofcom response to Issues Statement](#), paragraph 2.8.

⁹ For a fuller description of Ofcom's activities see Section 12 of the [Strategic Review of Digital Communications: Discussion document](#) (16 July 2015).

¹⁰ [Ofcom response to Issues Statement](#), paragraph 2.9.

¹¹ [Ofcom response to Issues Statement](#), paragraph 2.10.

functions was one of the means it had to promote competition in the mobile sector. In particular, the auction of 2.1GHz spectrum (3G) in 2000 was used to facilitate the entry of a new network operator to the market. Furthermore, the auction of 800MHz and 2.6GHz spectrum¹² (4G) in 2013 was used to maintain four national wholesalers, as Ofcom considered that UK consumers would be likely to benefit from better services at lower prices in future if following the auction there continued to be at least four credible national wholesalers of mobile services.¹³ Regulation of spectrum is discussed further below.

Market review obligations

Overview

11. Ofcom submitted the following synopsis of its market review process:

Our market review process involves three analytical stages. First, we define each relevant market in terms of its product and geographic scope. Then we assess whether any Communications Provider (CP) has a position of SMP (broadly equivalent to dominance) in any of the relevant markets. Finally, where we find SMP, we impose regulatory conditions (known as ‘SMP conditions’) on the CP concerned to address the competition concerns arising from such SMP.¹⁴

12. Article 16 of the Framework Directive and sections 84 and 84A CA03 require Ofcom to review competition in certain communications markets every three years. The purpose of a market review is to determine whether or not the market in question is effectively competitive and, where it is not, for Ofcom to impose appropriate remedies.¹⁵ Where remedies are already in place, Ofcom is required to consider whether they remain appropriate and proportionate in the light of changing market conditions.¹⁶

13. Before making a market power determination, Ofcom must identify the market which is, in its opinion, the one which (in the circumstances of the UK) it is appropriate to consider making such a determination. It must then analyse that market. The Framework Directive requires that National Regulatory

¹² Ofcom, [Assessment of future mobile competition and award of 800 MHz and 2.6 GHz: Executive summary](#).

¹³ This concern might have arisen if, as a result of the auction, fewer operators had access to sufficient spectrum to compete credibly at the wholesale level in the future. See [Ofcom response to Issues Statement](#), paragraph 3.8.

¹⁴ [Ofcom response to Issues Statement](#), paragraph 2.5.

¹⁵ See [BCMR 2013](#), Annex 2, regulatory framework; see [FAMR 2014](#), Annex 1, regulatory framework.

¹⁶ [Ofcom response to Issues Statement](#), paragraph 2.4.

Authorities (NRAs) define the market in accordance with the principles of competition law and taking the utmost account of the European Commission's (the Commission) Relevant Markets Recommendation¹⁷ and the EC SMP Guidelines.¹⁸ The Relevant Markets Recommendation identifies a set of product and services markets within the electronic communications sector in which ex ante regulation may be warranted.¹⁹

14. Section 87 CA03 requires Ofcom to impose conditions on CPs, where it has determined (in accordance with its market review) that a person has SMP in a specific market for electronic communications networks, electronic communications services or associated facilities. These aspects are discussed in more detail below.

Defining relevant markets/finding SMP

15. When defining relevant markets, Ofcom is required to take utmost account of the Commission's Recommendation. However, NRAs are able to regulate communications markets that differ from those identified in the Recommendation on Relevant Markets in specific circumstances where this is justified by national circumstances. In line with the Commission's Recommendation, when identifying markets other than those set out in the Recommendation, Ofcom would have to ensure the Commission does not raise any objections²⁰ and 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.

¹⁷ [EC, Commission Recommendation of 9 October 2014](#) 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.

¹⁸ Official Journal of the European Communities (11 July 2002), [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.

¹⁹ See [BCMR 2013](#), Annex 2, regulatory framework; see [FAMR 2014](#), Annex 1, regulatory framework.

²⁰ See [BCMR 2013](#), Annex 2, regulatory framework; see [FAMR 2014](#), Annex 1, regulatory framework. Also, [Commission guidelines on market analysis and the assessment of significant market power under the Community regulatory framework for electronic communications networks and services](#), and [EC, Commission Recommendation of 9 October 2014 on relevant product and service markets within the electronic communications sector](#).

- (c) The insufficiency of competition law alone to adequately address the market failures concerned.²¹
16. 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 explains that it 'is essential that ex ante regulatory obligations should only be imposed where there is no effective competition, i.e. in markets where there are one or more undertakings with SMP, and where national and Community competition law remedies are not sufficient to address the problem'.²²
 17. The definition of SMP is equivalent to the concept of dominance under EU/UK competition law. In essence, it means that Ofcom needs to determine whether any undertaking in the relevant market is in a position of economic strength affording it the power to behave to an appreciable extent independently of competitors, customers and ultimately consumers.²³
 18. Ofcom will also assess whether competition law by itself (without ex ante regulation) is sufficient within the relevant markets to address the competition problems which have been identified. Generally, the case for ex ante regulation is based on the existence of market failures which, by themselves or in combination, mean that the establishment of competition might not be possible if the regulator relied solely on ex post competition law powers.²⁴
 19. Where Ofcom has found a market to be effectively competitive, Ofcom is 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, Ofcom must identify the undertakings with SMP in that market and then impose appropriate obligations/conditions.²⁵ The EC SMP Guidelines clarify that, if NRAs designate undertakings as having SMP, they must impose on them one or more regulatory obligations.²⁶
 20. 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, Ofcom is required to demonstrate that

²¹ [Ofcom response to Issues Statement](#), paragraph 2.6.

²² See [BCMR 2013](#), Annex 2, regulatory framework (Business Connectivity Market Review); see [FAMR 2014](#), Annex 1, regulatory framework (Fixed Access Market Review).

²³ See [BCMR 2013](#), Annex 2, regulatory framework; see [FAMR 2014](#), Annex 1, regulatory framework.

²⁴ See [BCMR 2013](#), Annex 2, regulatory framework; see [FAMR 2014](#), Annex 1, regulatory framework.

²⁵ [FAMR 2014](#), A1.27. See, for example, the section on Mobile Backhaul services below, which discusses the SMP conditions imposed in respect of the provision of Network Access.

²⁶ See [BCMR 2013](#), Annex 2, regulatory framework; see [FAMR 2014](#), Annex 1, regulatory framework.

the obligation satisfied certain tests (including proportionality, transparency and objective justifiability). Further, in the case of price control, the NRA's market analysis must indicate that the lack of effective competition means that the CP concerned may sustain prices at an excessively high level or may apply a price squeeze to the detriment of end-users, and NRAs must take into account, among other things, the investment made by the CP.²⁷

21. As these functions fall under the CRF, Ofcom is also required to act in accordance with the six European Community requirements for regulation.²⁸ Furthermore, as stated above, Ofcom must take due account of applicable recommendations issued by the Commission under Article 19(1) of the Framework Directive.²⁹ Ofcom is also required to take utmost account of the applicable opinions, recommendations, guidelines, advice and regulatory best practices adopted by the Body of European Regulators of Electronic Communications where relevant.³⁰
22. Where Ofcom has made a market power determination, it must carry out a further analysis of the market within three years of the publication of the previous market power determination (subject to provision for extension in accordance with the process set out in Article 16(6)(a) Framework Directive).³¹
23. SMP is currently found in the following UK markets:³²
 - (a) Business connectivity markets (leased lines).
 - (b) Wholesale mobile call termination market.
 - (c) Fixed access markets: WLA, wholesale fixed analogue exchange lines, ISDN2, and ISDN30.

²⁷ See [BCMR 2013](#), Annex 2, regulatory framework; see [FAMR 2014](#), Annex 1, regulatory framework.

²⁸ Section 4 [CA03](#): in summary, 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 EU, to take account of the desirability of Ofcom's carrying out of 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; to encourage, as appropriate, the provision of network access and service interoperability for the purposes of securing efficiency and sustainable competition, efficient investment and innovation and the maximum benefit for customers of CPs and persons who make associated facilities available; and to encourage compliance with certain standards in order to facilitate service interoperability and secure freedom of choice for the customers of CPs.

²⁹ Section 4A [CA03](#).

³⁰ [Article 3\(3\) of Regulation No 1211/2009](#).

³¹ Section 84A(3) [CA03](#).

³² These are further expanded upon below. Note that each 'market' in this list may include multiple smaller markets and SMP findings can vary across them, for example the business connectivity market consists of multiple smaller markets, some of which are competitive.

(d) Fixed narrowband services markets.

(e) WBA.

Enforcing SMP conditions

24. With regard to the enforcement of SMP conditions, Ofcom's enforcement powers are set out in sections 94 to 104 CA03:
- (a) Section 94 CA03 provides for the enforcement of SMP apparatus conditions.
 - (b) Section 95 CA03 sets out that Ofcom can issue an enforcement notification where an SMP condition has been contravened, which Ofcom can seek to enforce in civil proceedings.
 - (c) Section 96 gives Ofcom the power to impose an appropriate and proportionate penalty in respect of contravention of an SMP apparatus condition, not to exceed 10% of turnover.³³
 - (d) In relation to SMP services conditions, under sections 96A to 97, in addition to imposing an appropriate and proportionate penalty not exceeding 10% of relevant turnover, Ofcom may impose requirements or give a direction requiring a person to comply with the SMP condition and remedy the consequences of any contravention.
 - (e) Ofcom has specific powers to deal with urgent cases under section 98, and powers to suspend service provision under sections 100 and 100A CA03.³⁴
 - (f) Section 104 provides for civil liability in relation to breaches of SMP conditions.
25. Ofcom also has powers and duties under sections 185 to 191 of CA03 to resolve disputes in relation to the provision of network access, and certain disputes in relation to (among other things) rights or obligations conferred or imposed by or under SMP conditions.
26. Dispute resolution undertaken by Ofcom is subject to appeal to the Competition Appeal Tribunal (CAT) under section 192 CA03. A person affected by a decision to impose or vary an SMP condition may therefore appeal to the CAT.

³³ S96 CA03.

³⁴ Section 103 makes it an offence to provide an electronic communications network or electronic communications services in contravention of such a suspension.

The 2005 BT Undertakings

Content

27. In addition to the market review process, the Undertakings given by BT are also relevant to Ofcom's regulation of the communications markets.
28. In 2004/05, Ofcom undertook a Strategic Review of Telecommunications³⁵ with a wide-ranging scope, considering competition and consumer protection issues in fixed telecoms and mobile networks. As part of that process, BT gave legally binding undertakings under the EA02 in lieu of a reference to the Competition Commission ('the Undertakings'), effective from 22 September 2005.³⁶ The Undertakings³⁷ have been varied on a number of occasions.
29. Ofcom submitted that the Undertakings imposed functional separation on BT so that it was required to operate its infrastructure business, Openreach, as if it were a separate organisation.³⁸ The undertakings also require Openreach to provide its products and services (a defined set of access and backhaul services) on an Equivalence of Inputs (EoI) basis.³⁹ Openreach's managers' and employees' incentives and bonuses solely depend on Openreach's objectives.⁴⁰ Ofcom recognised in its 2005 Strategic Review of Telecommunications that BT's previous vertically integrated structure gave it both the incentive and ability to discriminate against competitors. The main manifestation of that concern was that competitors faced inequality of access.⁴¹ Key core elements of functional separation are therefore that:
- (a) 'Openreach was created as a new organisation (with a separate brand) that was intended to be operationally distinct from the rest of the BT group'.
 - (b) 'The Openreach management team has to agree an annual operating plan with the BT Board, but within that operating plan can approve capital expenditure of up to £75m. When making such decisions, it is required to take account of the requirement of all downstream providers'.
 - (c) 'All incentive remuneration of Openreach employees depends solely on Openreach objectives and is not linked to BT Group performance ...'.⁴²

³⁵ Original publication: Ofcom (22 September 2005): [Final statements on the Strategic Review of Telecommunications, and undertakings in lieu of a reference.](#)

³⁶ [Original undertakings](#), Annex A.

³⁷ [Undertakings given to Ofcom by BT pursuant to the Enterprise Act 2002](#) (19 June 2014).

³⁸ [Ofcom response to Issues Statement](#), paragraph 2.7.

³⁹ [ibid](#), paragraph 2.7.

⁴⁰ [ibid](#), paragraph 2.7.

⁴¹ Ofcom (16 July 2015), [Strategic Review of Digital Communications: Discussion document](#), paragraph 11.8.

⁴² [ibid](#), paragraphs 11.11–11.13.

Equivalence of Inputs

30. Ofcom informed us that under the Undertakings, BT is obliged to provide equal access to its network. Such access must be provided on Eol terms. The Eol obligation is defined in the Undertakings as meaning that, when providing access, all products and services must be delivered equivalently to all CPs, and (subject to the possibility of providing different service levels at different prices and Service Level Guarantees) all CPs (including BT's downstream divisions) must enjoy the:
- (a) same availability of products and services;
 - (b) same timescales, terms and conditions, including price;
 - (c) same systems and processes;
 - (d) same reliability and performance; and
 - (e) same commercial information.⁴³
31. Ofcom has outlined that Eol 'aims to ensure a level playing field between BT's downstream business units and competitors purchasing access to its networks ... [and] ensures that any deficiencies [in the products and services supplied] are felt by BT itself, as well as its downstream competitors, so that BT is incentivised to address them'.⁴⁴

Statement of Requirements/new products

30. In addition, Ofcom submitted that the Undertakings required that BT operated a Statement of Requirements (SoR) process (ie a new product development process) subject to oversight by the Equality of Access Board (EAB) established as part of the Undertakings. Ofcom has outlined that as part of the Undertakings, 'BT committed that Openreach would process all requests for new product developments [and] BT's Statement of Requirements (SoR) process enables Openreach customers to formally request the introduction of a new product or change to an existing one' [and these requests must be] determined by Openreach and provided to all CPs on equal terms'.⁴⁵
31. Ofcom has indicated that it is currently conducting work in the SoR area and is aware of concerns that have been raised about the product development

⁴³ [Ofcom response to Issues Statement](#), paragraph 2.7, and the definitions section of [Final statements on the Strategic Review of Telecommunications, and undertakings in lieu of a reference under the Enterprise Act 2002](#), p61.

⁴⁴ Ofcom (16 July 2015), [Strategic Review of Digital Communications: Discussion document](#), paragraph 11.17.

⁴⁵ [Strategic Review of Digital Communications: Discussion document](#), paragraph 11.19.

process through the fixed access and business connectivity market reviews, including concerns that Openreach 'favours requests which align with BT's wider interests and rejects a high proportion of requests from competing providers on the grounds that their request is not commercially attractive to Openreach'.⁴⁶ Further information on the SoR process and how it is monitored is set out in the section on Mobile Backhaul below.

Monitoring and enforcement

32. The Undertakings were accepted in lieu of a market investigation reference under the EA02. Accordingly, if the undertakings are failing to deliver a solution, Ofcom would be able to open an investigation with a view to making a market investigation reference to the Competition Markets Authority.⁴⁷
33. The Undertakings also required BT to establish an EAB,⁴⁸ which, alongside BT, is obliged to identify and report on as well as investigate, complaints about BT's compliance with the Undertakings⁴⁹ and to conduct and publish an annual review.⁵⁰ Ofcom described the EAB as an independent board within BT with certain reporting obligations to the BT board. The EAB is obliged to inform Ofcom of non-trivial breaches.⁵¹ Ofcom submitted that 'such breaches as may arise, whether identified and reported by BT to the EAB or reported to the EAB by another party or from the EAB's own initiated investigations, are classified by the EAB as trivial or non-trivial'. The EAB publishes annual reports which, among other things, summarise its findings in relation to complaints including complaints about breach of the EoI obligation. Ofcom informed us that the EAB and Ofcom also monitor the SoR process (product development requests) for compliance with BT's Undertakings commitments and as part of Ofcom's programmatic work on wholesale leased lines (see below).
34. Ofcom is also considering the SoR process in relation to its ongoing Business Connectivity Market Review (BCMR).
35. The Undertakings are legally binding and:
 - (a) Section 15 of the Undertakings sets out a procedure which applies where Ofcom has reasonable grounds for believing that there has been a breach of the Undertakings. Where this process applies and Ofcom is satisfied

⁴⁶ [ibid](#), paragraphs 11.38 & 11.39.

⁴⁷ Paragraph 8.43 of the [statement accompanying the undertakings](#).

⁴⁸ Section 10 of the [Undertakings](#) (see section 10.1).

⁴⁹ Section 10.11 of the [Undertakings](#).

⁵⁰ Section 10.27 of the [Undertakings](#). See paragraphs 10.9 onwards of the [Undertakings](#).

⁵¹ Section 10.17 of the [Undertakings](#).

there has been a breach, Ofcom may direct BT as to the specific steps to be taken to remedy the breach. If BT accepts the direction, failure to comply with the direction is also itself a breach of the Undertakings.

- (b) Ofcom has outlined that it currently does not have ‘the powers to impose financial penalties on BT’ and it is considering whether having in the future the ability to levy fines would provide ‘a stronger incentive effect on BT’s behaviour’.⁵²

36. Notably, Ofcom submitted that the EAB ‘may suggest’ to BT remedial action to ensure compliance with the Undertakings and BT must take ‘due account’.⁵³

37. The Undertakings are also enforceable under the EA02. These provisions apply generally to the enforcement of all undertakings accepted under Part 4 of the EA02, not just the BT Undertakings. Specifically, Ofcom informed us that:

- (a) Ofcom may enforce a breach pursuant to s167(6) of the EA02 by bringing civil proceedings for an injunction, for interdict or for any other appropriate relief or remedy (the CMA also has concurrent powers in this regard),⁵⁴ and

- (b) third parties sustaining loss or damage may enforce a breach pursuant s167(4) of the EA02 by bringing a civil action for breach of a statutory duty.

Strategic Review of Digital Communications

38. Ofcom is consulting (until 8 October 2015) on a discussion document in respect of the UK’s digital communications markets as part of its Strategic Review of Digital Communications. It is Ofcom’s first strategic assessment of the telecommunications sector in ten years and only the second since Ofcom was established.⁵⁵ The assessment will consider future policy challenges across fixed, mobile and content sectors.⁵⁶ As part of its review, Ofcom is consulting on the regulation of vertically integrated firms (such as BT) and whether there is a need to update or evolve the current model of fixed access network functional separation.⁵⁷

⁵² [Strategic Review of Digital Communications: Discussion document](#), paragraph 11.58.

⁵³ See section 10.15.1 of the [Undertakings](#).

⁵⁴ Paragraph 8.37 of the [statement accompanying the undertakings](#).

⁵⁵ [Strategic Review of Digital Communications: Discussion document](#), ‘About this document’.

⁵⁶ [ibid.](#)

⁵⁷ [Strategic Review of Digital Communications: Discussion document](#), paragraph 11.6.

39. With respect to the functional separation of Openreach (which was established following Ofcom's first strategic review), Ofcom's discussion document outlines that in 2005 Ofcom 'attempted to address concerns associated with non-price discrimination through the functional separation ... associated with a strict form of non-discrimination obligation [EoI] ... intended to give all competing providers equal access to BT's network'. Ofcom's view is that this 'approach has generally led to good outcomes, but there have also been some concerns' and the current approach 'limits the ability to discriminate but does not address the underlying incentive so risks to competition may remain'.⁵⁸
40. Section 11 of the discussion document sets out Ofcom's current views on the state of the landscape in respect of BT's functional separation and invites comments from stakeholders to inform Ofcom's detailed analysis of the range of potential regulatory models. Ofcom noted the potential for continued discrimination by BT in respect its equivalence obligations. This is because, at a downstream level, BT does not always use the same products as its competitors.⁵⁹ Where BT does not consume the same products, 'equivalence is ineffective' and instead Ofcom must rely on detailed rules to address the potential for discrimination. Those rules are subject to the risk of gaming 'given information asymmetries between the regulator, the regulated firm and its competitors'.⁶⁰
41. Ofcom is also considering whether there may be new opportunities for discrimination as telecoms services evolve. The increased consumer appetite for bundles may mean that more of those services make use of upstream fixed network inputs from Openreach (including access and backhaul). As a result, this 'might mean BT's incentive to discriminate between downstream providers increases'.⁶¹
42. Ofcom outlines four courses of possible action that it should consider for its overarching fixed telecoms regulatory strategy and welcomed stakeholders views on whether it should:
- (a) continue with the current strategic regulatory framework;
 - (b) strengthen the current model of functional separation;
 - (c) consider structural separation; or

⁵⁸ *ibid*, paragraphs 11.4 & 11.5.

⁵⁹ *ibid*, paragraphs 11.30 & 11.31.

⁶⁰ *ibid*, paragraph 11.31.

⁶¹ *ibid*, paragraph 11.32.

(d) substantial deregulation and greater reliance on end-to-end competition.⁶²

43. In addition, Ofcom states that it will consider whether it should undertake a strategic refocus on passive remedies rather than active ones, for instance, offer access to elements of network infrastructure such as duct, dark fibre or wavelengths.⁶³

Ofcom's dispute resolution powers

44. The right for CPs to bring a regulatory dispute to Ofcom and Ofcom's powers and duties in resolving regulatory disputes are set out in sections 185 to 191 CA03.

45. Ofcom has jurisdiction to resolve the following types of regulatory disputes under the CA03:

(a) a dispute relating to the provision of network access (section 185(1) CA03);

(b) a dispute relating to the entitlements to network access that a CP is required to provide by or under a regulatory condition, such as an SMP condition, imposed on the provider under section 45 of CA03 (section 185(1A) CA03); and

(c) a dispute, which is not an 'excluded dispute',⁶⁴ relating to rights or obligations conferred or imposed by or under a condition set under section 45 of CA03 (such as an SMP condition) or any of the enactments relating to the management of the radio spectrum (section 185(2) CA03).

46. The process for bringing a dispute to Ofcom and the procedure that Ofcom follows in dealing with it is set out in Ofcom's Dispute Resolution Guidelines 2011.⁶⁵ Ofcom told us that stakeholders submitting a dispute to Ofcom were expected to make adequate, well-reasoned submissions, supported by evidence. The information provided to Ofcom must be sufficient to enable Ofcom, at the outset, to determine whether the dispute satisfies the statutory conditions for a referral and whether or not it is appropriate for Ofcom to decide to handle it. BT informed us that Ofcom had limited scope to reject a dispute where it related to an SMP condition. Although Ofcom has discretion under section 186(2) of the CA03 regarding the acceptance of a dispute, if it

⁶² [ibid](#), paragraphs 1.37 & 1.38 and section 11.

⁶³ [ibid](#), paragraphs 1.39 & 1.40.

⁶⁴ Ofcom (7 June 2011), [Dispute Resolution Guidelines](#).

⁶⁵ [ibid](#).

considers there are no alternative means of resolution, or if those alternative means would not be consistent with the Community requirements⁶⁶ or provide prompt and satisfactory resolution, it is required to handle it under section 186(3) CA03. Ofcom's Dispute Resolution Guidelines 2011 provide that where one party is designated as having SMP, this could result in an imbalance in negotiating power in the context of alternative dispute resolution (ADR) (paragraph 4.13). In these circumstances, Ofcom is more likely to handle the dispute where it considers that ADR, as one means of alternative resolution, may not be effective. As a result, BT told us that Ofcom's dispute resolution process was a significant part of the SMP regime.

47. Ofcom additionally expects a dispute submission to meet certain minimum requirements, such as the facts of the case, details of the issues in dispute and the remedies sought. Overall, Ofcom submitted that it wished to see evidence that the submitting party had made genuine efforts to enter into good faith negotiations with the other side.
48. Ofcom informed us that where it had decided it was appropriate to handle a dispute referred to it, it must determine the dispute within four months of doing so, unless exceptional circumstances apply. Its main power in resolving disputes (other than those relating to spectrum disputes) is to do one or more of the following:
 - (a) to make a declaration setting out the rights and obligations of the parties to the dispute;
 - (b) to give a direction fixing the terms or conditions of transactions between the parties to the dispute;
 - (c) to give a direction imposing an obligation, enforceable by the parties to the dispute, to enter into a transaction between themselves on the terms and conditions fixed by Ofcom; and/or
 - (d) to give a direction, enforceable by the party to whom the sums are to be paid, requiring the payment of sums by way of adjustment of an underpayment or overpayment.
49. A determination made by Ofcom for resolving a dispute binds all parties to the dispute.

⁶⁶ See further, section 4, CA03.

50. Ofcom may additionally choose to exercise its powers to set, modify or revoke regulatory conditions (including SMP conditions and general conditions) as a result of its consideration of a dispute.
51. Ofcom submitted that there had been no disputes relating to discrimination in the provision of BCMR services during the current BCMR period.

Regulation of spectrum

52. Ofcom is responsible for managing civilian use of radio spectrum and auctions mobile spectrum.⁶⁷ Ofcom submitted that it ensured the appropriate allocation and assignment of spectrum through licensing and undertook competition assessments and designed auction rules with the aim of ensuring that the allocation met market needs and would not have a negative impact on competition on the retail and wholesale mobile markets.⁶⁸ For example, the auction of 2.1GHz (3G) spectrum in 2000 was used to facilitate the entry of a new MNO to the market.⁶⁹ Ofcom submitted that its 'management of spectrum does influence the retail mobile market'.⁷⁰
53. For the 800MHz and 2.6GHz (4G) auction in 2013, Ofcom's competition measures included both a cap on overall spectrum holdings (of 210 MHz) and a cap on low frequency spectrum (of 55MHz).⁷¹ Spectrum portfolios were also reserved for a fourth national wholesaler, as Ofcom considered that UK consumers would be likely to benefit from better services at lower prices in the future if, following the auction, there continued to be at least four credible national wholesalers of mobile services.⁷²
54. Ofcom published consultations on the 2.3/3.4 GHz auction in November 2014 and May 2015.⁷³
 - (a) In November 2014, Ofcom consulted on auctioning spectrum currently held by the Ministry of Defence which would make a significant amount (190 MHz) of further spectrum available for civil use by 2020.⁷⁴ This is known as the Public Sector Spectrum Release, or PSSR, award. This

⁶⁷ See [spectrum information](#) pages on Ofcom's website.

⁶⁸ [Ofcom response to Issues Statement](#), paragraph 3.8.

⁶⁹ [ibid](#), paragraph 3.8. See paragraph 10 above.

⁷⁰ [ibid](#), paragraph 3.8.

⁷¹ Ofcom, Assessment of future mobile competition and award of 800 MHz and 2.6 GHz: [Executive summary and Statement](#).

⁷² [Executive summary](#), [ibid](#), p4. Also, see [Ofcom response to Issues Statement](#), paragraph 3.8.

⁷³ Ofcom (26 May 2015), [Public Sector Spectrum Release: Award of the 2.3 and 3.4 GHz spectrum bands](#).

⁷⁴ Ofcom consulted on this in November 2014, before the BT/EE and H3G/O2 mergers were announced: [Public Sector Spectrum Release \(PSSR\): Award of the 2.3 GHz and 3.4 GHz bands](#) (7 November 2014). Also see [Ofcom response to Issues Statement](#), paragraph 3.11.

spectrum may provide additional capacity for MNOs. The November consultation proposed a safeguard cap of 37% of overall volume of mobile spectrum that any operator could hold.

- (b) In light of the BT/EE and H3G/02 transactions, Ofcom told us that the more recent consultation proposed the retaining of the option of withholding some spectrum from the auction and awarding it at a later date.⁷⁵
- (c) In its phase 2 submission, Ofcom noted that further spectrum, currently held by Qualcomm, was recently put up for sale and could be acquired by one or more of the MNOs. Following a request from Qualcomm, Ofcom varied its licence to allow this spectrum to be used for Supplemental Downlink (SDL), which can provide additional mobile download capacity. Ofcom made this spectrum subject to the Mobile Trading Regulations, which means that Ofcom would be able to consider the impact on competition of any sale before deciding on whether to approve that trade.⁷⁶ On 26 August 2015, subsequent to Ofcom's submission Qualcomm confirmed that it had agreed to sell its 40 MHz of UK L-band spectrum to Vodafone and H3G.⁷⁷ The operators each agreed to purchase 20 MHz of the spectrum.⁷⁸ Ofcom issued an invitation to comment on the proposed transfers and on 22 September 2015 published its statement on the matter.⁷⁹ In its conclusion Ofcom considered it appropriate to consent to each of the proposed trades and stated that it would proceed to issue licences to Vodafone and H3G in respect of the relevant frequency bands.⁸⁰

Regulation of mobile backhaul (business connectivity)

- 55. Openreach offers copper and fibre leased lines which are used for mobile backhaul. Ofcom found BT to have SMP in most of the UK and Openreach products are provided on a regulated basis 'almost nationally'.⁸¹ CPs source mobile backhaul either from Openreach, or from BTW which itself sources mobile backhaul from Openreach.⁸² Accordingly, in respect of the applicable

⁷⁵ Ofcom (26 May 2015), [Public Sector Spectrum Release: Award of the 2.3 and 3.4 GHz spectrum bands](#).

⁷⁶ Ofcom response to Issues Statement, paragraph 3.12.

⁷⁷ Qualcomm press release (2015), ['Qualcomm Agrees to Sell UK L-band Spectrum to Vodafone and H3G'](#).

⁷⁸ Reported on 26 August 2015 in total telecom: [Qualcomm confirms UK spectrum sale to Voda, 3](#).

Sale announced by Qualcomm on 26 August 2015: [Qualcomm Agrees to Sell UK L-Band Spectrum to Vodafone and H3G](#).

⁷⁹ Ofcom (2015), [Trade of frequencies in the 1452-1492 MHz band from Qualcomm UK Spectrum Ltd to Vodafone Limited and Hutchison 3G UK Limited](#).

⁸⁰ See [spectrum trading](#) pages on Ofcom's website.

⁸¹ Ofcom response to Issues Statement, paragraph 5.8.

⁸² Openreach products are just leased lines, whereas the BTW product is a wider managed service that uses leased lines as an input.

regulation to the provision of leased lines by Openreach to CPs, the Undertakings and SMP conditions imposed under the BCMR are of relevance.

56. In summation, the Undertakings require Openreach to provide its products and services on an EoI basis so as to limit the ability of Openreach to engage in discriminatory behaviour.⁸³ Furthermore, in 2013, Ofcom imposed a number of SMP conditions on Openreach in order to address competition problems identified in its assessment of wholesale leased lines in the BCMR 2013. The SMP conditions require Openreach to supply Ethernet products on an EoI basis.⁸⁴ These conditions are detailed below.

BCMR 2013 SMP conditions

57. In terms of Ofcom's market definition and SMP assessment under the BCMR 2013, Ofcom submitted that it conducted its market review on a forward-looking basis, taking into account expected or foreseeable developments during the period prior to the next market review. For each level of the supply chain, a number of different product markets were defined, based on the extent of likely substitution and observed differences in competitive conditions between leased lines services using different interface technologies (ie Traditional Interface (TI) (either TDM or analogue), Alternative Interface (AI) (typically Ethernet), and Multiple Interface (MI)) and different bandwidths.⁸⁵
58. Ofcom concluded that Ethernet leased lines used as components of managed backhaul services supplied to MNOs should form part of the broader leased lines markets.⁸⁶ Ofcom has therefore defined markets for leased lines in general rather than specifically for mobile backhaul.⁸⁷ Ofcom's review focused primarily on the upstream inputs (ie those predominately supplied by Openreach and not on downstream managed backhaul services, as Ofcom considers that the upstream regulation of Openreach products would be a sufficient constraint on BTW's provision of these services).⁸⁸

⁸³ [Ofcom response to Issues Statement](#), paragraph 5.12. BTW also supplies mobile backhaul products (such as MEAS), which use EoI inputs, but is not subject itself to EoI. Rather Ethernet products must be supplied by Openreach on an EoI basis. See [Ofcom's submission](#) dated 30 July 2015 in response to RFI, paragraph 8.

⁸⁴ Answer to question 8, Ofcom response to Regulatory Framework RFI dated 30 July 2015. Also [Ofcom response to Issues Statement](#), paragraph 5.12.

⁸⁵ [Ofcom response to Issues Statement](#), paragraph 5.15.

⁸⁶ [BCMR 2013](#), paragraph 4.11.

⁸⁷ [Ofcom response to Issues Statement](#), paragraph 5.13.

⁸⁸ [ibid](#), paragraph 5.13.

59. Furthermore, Ofcom defined three geographic markets reflecting differences in competitive conditions between different parts of the UK for some product markets.⁸⁹
60. Mobile backhaul services fall within the following wholesale markets identified by Ofcom in the 2013 BCMR statement:⁹⁰
- (a) the Wholesale market for low bandwidth alternative interface symmetric broadband origination in the UK excluding the Hull Area and the WECLA, at bandwidths up to and including 1Gbit/s; and
 - (b) the Wholesale market for low bandwidth alternative interface symmetric broadband origination in the WECLA, at bandwidths up to and including 1 Gbit/s.
61. In these markets BT is subject to a set of obligations which specify how it must provide Network Access. The BCMR 2013 SMP conditions apply until the end of March 2016 and include the following:⁹¹
- (a) Condition 1: requirement to provide network access on reasonable request. This condition requires BT to provide network access (ie wholesale leased line services) in the markets in which it has SMP to any CP on reasonable request. BT is further required to provide network access as soon as reasonably practicable and to provide it on fair and reasonable terms, conditions and charges.⁹²
 - (b) The non-discrimination conditions:
 - (i) Condition 3 (no undue discrimination) requires BT not to discriminate unduly in the provision of network access. This condition is interpreted in accordance with Ofcom's guidance on undue discrimination.⁹³ Under these guidelines, Ofcom considers that BT has discriminated unduly if it were to discriminate between internal and third party wholesale customers without objective justification.

⁸⁹ [ibid](#), paragraph 5.16.

⁹⁰ Ofcom, [Business connectivity market review – final statement](#). See also answer to questions 10(b) and (c), Ofcom response to Regulatory Framework RFI dated 30 July. Note that traditional Interface Symmetric Broadband Origination (TISBO) and Multiple Interface Symmetric Broadband Origination (MISBO) products are also used for mobile backhaul services.

⁹¹ See [BCMR 2013](#), Annex 7, Schedule 2, for the full list.

⁹² [Ofcom response to Issues Statement](#), paragraph 5.17.

⁹³ Ofcom (November 2005), [Undue Discrimination by SMP Providers](#).

- (ii) Condition 4 (Equivalence of Inputs basis) requires BT to provide network access (with certain specified exceptions⁹⁴) on an EoI basis. EoI requires BT to provide exactly the same wholesale services to third parties as it provides to its own downstream divisions. Network access must be provided on the same terms, conditions and timescales and using the same processes and support systems.⁹⁵
 - (c) Condition 10 (requests for new forms of network access) sets out specific obligations relating to the SoR process operated by BT. Condition 10 therefore specifies obligations relating to the handling of requests for new forms of network access (ie requests for new services). This condition requires BT to publish guidelines specifying how requests may be submitted and how it will process them. The condition also specifies a timetable for the processing of requests. It is only one part of the overall framework imposed by Ofcom in relation to new product developments. SoRs are discussed at regular bilateral meetings between Ofcom and the EAB.
 - (d) Charge control: Ofcom controls the level of charges that BT can set for its wholesale products based on a RPI-X approach.⁹⁶
 - (e) Requirement not to discriminate unduly: for example, if BT were to price in a way that unduly discriminated against a non-BT downstream customer – even if that were compliant with price control – that could be considered a breach.⁹⁷
62. Ofcom submitted that none of the SMP obligations imposed on BT set rules concerning investment decisions explicitly, however, the obligations discussed above, particularly the access and non-discrimination obligations imposed a framework under which BT must make investment decisions concerning wholesale leased lines services.

Future developments

63. Ofcom is in the process of consulting on the next BCMR review (BCMR 2016).⁹⁸ Ofcom's BCMR consultation document was published on 15 May

⁹⁴ Specifically accommodation in BT exchanges, backhaul segments between certain core nodes and long-distance WDM services.

⁹⁵ [Ofcom response to issues statement](#), paragraph 5.17.

⁹⁶ [ibid](#), paragraph 5.17, and for charge control proposals in relation to Ethernet services see paragraphs 5.23–5.25.

⁹⁷ [Ofcom response to issues statement](#), paragraph 5.17.

⁹⁸ [ibid](#), paragraph 5.19,

2015,⁹⁹ with a further consultation on wholesale leased line charge controls and dark fibre pricing being published on 12 June 2015.¹⁰⁰ Any SMP obligations imposed as a result of BCMR 2016 would be in force from April 2016 to March 2019.¹⁰¹ Proposals by Ofcom set out in the BCMR 2016 include:

- (a) Proposal of introducing regulated access to dark fibre. The price of the proposed dark fibre remedy is proposed to be linked to the price of two active Ethernet products, EAD 1 Gbit/s and EAD-LA 1 Gbit/s, each of which will have a CPI-13.5% sub-cap. Ofcom submitted that this would appropriately limit the potential for gaming (as otherwise BT might have an incentive to load common costs allowed to be recovered across the basket into these products to increase the price of passives).¹⁰²
- (b) Ofcom also proposes to require the difference between the EAD and the EAD-LA price to be the same as the difference in incremental cost of the two products. The rationale for this is that the presence of the current differential disadvantages CPs who make relatively limited use of BT exchanges as aggregation points (and who must therefore use EAD rather than EAD-LA) pay higher charges for comparable circuit configurations. Ofcom considers that restricting the differential would ensure that the choice between the two products is productively efficient as it would be based on differences in the underlying costs of provision. Additionally, setting the differential in this way would reduce the risk of excessive pricing or undue discrimination by BT and address the risk that BT recovers more common costs from non-Local Access variants, which are proportionally more important to its competitors.¹⁰³
- (c) Ofcom submitted that one of the reasons it proposed a dark fibre remedy in BCMR 2016 was that it could facilitate innovation by other CPs in the active 'layer' rather than relying on the SoR process.
- (d) The consultation on leased lines charge controls and dark fibre pricing has now closed and Ofcom is currently considering stakeholder responses, non-confidential versions of which have been published on its website. It is too early to get an indication as to the outcome of the consultation in this regard. Ofcom takes responses to the consultation into

⁹⁹ Ofcom, [Business Connectivity Market Review – May 2015](#).

¹⁰⁰ Ofcom, [Business Connectivity Market Review: Leased lines charge controls and dark fibre pricing](#).

¹⁰¹ Should Ofcom proceed with mandating access to Openreach dark fibre, this would be introduced from April 2017. However, the SMP condition under which the dark fibre regulation would be brought in would be in force from April 2016.

¹⁰² [Ofcom response to issues statement](#), paragraph 5.24.

¹⁰³ [ibid](#), paragraph 5.25.

account before reaching its final conclusions and publishing its statement.¹⁰⁴ In the first instance, Ofcom must notify the Commission of its proposed decision for comments from the Commission, BEREC and other NRAs. This process typically takes six weeks and Ofcom would therefore expect to publish a draft statement in February 2016. Ofcom makes public the draft statement it notifies to the Commission, but this step is not a further public consultation.¹⁰⁵ The CMA understands that Ofcom plans to publish its final statement prior to 1 April 2016.

Regulation of Wholesale Local Access and Wholesale Broadband Access

Wholesale Local Access

63. In 2014, in its Fixed Access Market review (FAMR),¹⁰⁶ Ofcom told us it concluded that BT had SMP in the supply of WLA in the UK excluding the Hull area.¹⁰⁷ Historically, Ofcom's approach has been to intervene upstream in order to facilitate competitive downstream markets.¹⁰⁸
64. In order to promote effective competition in the broadband and voice markets, Ofcom requires BT to provide various WLA¹⁰⁹ services on regulated terms such as Local Loop Unbundling (LLU) for copper-based current generation access (CGA) services, and Virtual Unbundled Local Access (VULA)¹¹⁰ for fibre-based next generation access (NGA) services. This allows other CPs to use BT's access network to provide competing voice and broadband services in the downstream markets.
65. Ofcom has defined a number of markets that are downstream from the provision of WLA. One such intermediate market is referred to as the Wholesale Broadband Access (WBA) market.¹¹¹ Ofcom submitted that no

¹⁰⁴ Ofcom, [Business Connectivity Market Review: Leased lines charge controls and dark fibre pricing](#).

¹⁰⁵ The process is set out in the [CA03](#), in particular sections 48, 48A, 48B, 48C, 79, 80, 80A, 80B, which implement the equivalent provisions of the Framework Directive and the Access Directive.

¹⁰⁶ Ofcom (26 June 2014), [Fixed access market reviews: wholesale local access, wholesale fixed analogue exchange lines, ISDN2 and ISDN30](#).

¹⁰⁷ [Ofcom response to issues statement](#), paragraph 6.10.

¹⁰⁸ [ibid](#), paragraph 6.3.

¹⁰⁹ Wholesale local access refers to the fixed connection from the local exchange or access node to the end-user.

¹¹⁰ Virtual unbundled local access provides access to BT's NGA network in a way that is similar to how LLU provides access on the CGA network. However, rather than providing a physical line, VULA provides a virtual connection that gives CPs a direct link to their customers and provides flexibility over how this link is integrated into their network and over product offerings. The product that BT supplies in order to meet this obligation is called Generic Ethernet Access (GEA).

¹¹¹ The WBA market sits between the retail broadband market, which relates to the products that consumers buy, and the WLA market, which relates to the access connection between the consumer and the network. The WBA market concerns the wholesale broadband products that CPs provide for themselves and sell to each other.

further remedies were imposed in the geographic areas where LLU had been effective in promoting broadband competition (referred to as Market B).¹¹²

66. However, in some areas (referred to as Market A), the CMA understands that WLA remedies have not been as effective at promoting entry.¹¹³ This is largely in rural areas where WLA remedies are less viable due to the limited number of premises in the area, which reduces CPs' opportunities to recover the costs of installing LLU equipment. In such areas, Ofcom imposes regulation further down the supply chain at the WBA level. Ofcom informed us that the regulated areas have been shrinking, as LLU roll-out has progressed, and are now significantly smaller.¹¹⁴ For example, in the 2014 WBA review Ofcom found that areas in which BT had SMP in the provision of WBA covered 9.5% of UK premises, while in the 2010 WBA review, 21.7% of UK premises were in SMP areas.¹¹⁵
67. Other markets that are downstream from the provision of WLA include the provision of Wholesale Fixed Analogue Exchange Lines (WFAEL). Ofcom found that BT possessed SMP in the provision of WFAEL in the UK excluding the Hull area. To address that SMP Ofcom told us it imposed regulation including an obligation to supply wholesale line rental (WLR) and a charge control.¹¹⁶

Current WLA regulation

68. As part of the FAMR, for some services charge controls were deemed necessary by Ofcom as a remedy to address BT's 'ability and incentive to set or maintain prices at an excessively high level'.¹¹⁷ Other SMP remedies were also imposed by Ofcom. These remedies remain in place until 31 March 2017.¹¹⁸
69. Ofcom submitted that the other SMP remedies imposed in respect of the WLA market included the following:¹¹⁹

¹¹² [Ofcom response to issues statement](#), paragraph 6.5.

¹¹³ [ibid](#), paragraph 6.6.

¹¹⁴ [ibid](#), paragraph 6.6.

¹¹⁵ In the 2014 WBA Statement, Ofcom noted that 9.5% of UK premises fell within Market A (defined as exchange areas where there are no more than two Principal Operators (POs) present or forecast to be present). In the 2010 WBA market review, Ofcom found that 11.7% of premises were within areas where only BT was present or forecast to be present, and 10% of premises were served by exchanges where two POs were present or forecast to be present and exchanges where three POs were present or forecast to be present but where BT's share was greater than or equal to 50% (paragraph 4.9 of Ofcom's [July 2013 WBA consultation](#)). This reflects a change to Ofcom's approach to geographic market definition in its 2014 WBA Statement.

¹¹⁶ [Ofcom response to issues statement](#), paragraph 6.7.

¹¹⁷ [FAMR 2014](#), Volume 2, paragraphs 1.1 & 1.2.

¹¹⁸ [FAMR 2014](#), Volume 2, paragraph 1.4.

¹¹⁹ [Ofcom response to issues statement](#), paragraph 6.13.

- (a) Requirement to provide network access on reasonable request.
- (b) Requirement to publish and follow a process to address requests for new forms of network access (SoR).
- (c) Requirement not to unduly discriminate.
- (d) Equivalence of Inputs.
- (e) Cost accounting.
- (f) Accounting separation.
- (g) Requirement to meet minimum quality of service standards.
- (h) Requirement to publish a Reference Offer¹²⁰ (including specifying services subject to SLAs¹²¹/SLGs¹²²).
- (i) Requirement to notify changes to charges, terms and conditions.
- (j) Requirement to notify technical information.¹²³

70. Specifically, LLU products must be provided by BT on an Eol basis.¹²⁴

VULA

71. For CGA, Ofcom imposed cost-based charge controls for LLU and WLR.¹²⁵ However, for NGA, it did not apply a cost-based charge control on VULA in this market review period.¹²⁶ Instead, Ofcom has imposed an SMP condition requiring BT to maintain a minimum margin between the wholesale price of VULA and the retail price of broadband packages that use VULA as an input.¹²⁷ Ofcom told us that this reflected its view that BT should retain broad flexibility over the level of VULA prices during this market review period, but sought to protect and promote competition at the retail level by clearly setting out the minimum VULA margin BT must maintain. Ofcom submitted that this

¹²⁰ Reference Offer means the terms and conditions on which BT is willing to enter into an agreement for the provision of network access in accordance with its SMP Condition to provide access on reasonable request.

¹²¹ A Service Level Agreement is a contractual commitment provided by Openreach to CPs about service standards.

¹²² A Service Level Guarantee is a contractual commitment by Openreach to CPs specifying the amount of compensation payable by Openreach to a CP for a failure to adhere to an SLA.

¹²³ [Ofcom response to issues statement](#), paragraph 6.13.

¹²⁴ Ofcom (26 June 2014), [Fixed access market reviews: wholesale local access, wholesale fixed analogue exchange lines, ISDN2 and ISDN30](#).

¹²⁵ Full details are set out in Section 13, 15, 16 and 18 of [2014 FAMR Statement](#). Details of the LLU and WLR charge controls are set out in Volume 2 of the statement.

¹²⁶ With the exception of GEA migration charges. [FAMR 2014](#), Volume 1, paragraph 12.210–12.212.

¹²⁷ Further details are set out in [Ofcom's statement](#) of 19 March 2015 (the 'VULA Margin Statement').

was imposed with a view to ensure that BT did not set the VULA margin such that it prevented an operator with slightly higher costs than BT (or some other slight commercial drawback relative to BT) from being able to profitably match BT's retail superfast broadband offers.¹²⁸

72. In deciding not to impose a cost-based charge control in relation to VULA,¹²⁹ the FAMR 2014 shows that Ofcom weighed up the risk of unregulated pricing levels against the risk of Ofcom determining inappropriate price levels and the potential impact on investment.¹³⁰
73. Ofcom consulted on its approach to the VULA margin test and published its final statement in March 2015.¹³¹ The VULA margin test is currently in force.
74. Ofcom's approach in its VULA Margin Statement has been appealed to the CAT by both BT¹³² and by TalkTalk.¹³³ Each is intervening in the other's appeal, whilst Sky is intervening in BT's appeal. A CAT hearing in respect of the non-specified price control matters raised in BT's appeal took place in December 2015. The specified price control matters raised in each of BT's and TalkTalk's appeal were referred to the CMA on 5 January 2016.
75. Ofcom submitted that it expected the specified price control matters raised in the appeals to be referred to the CMA after 17 November 2015. The CAT hearing on non-specified price control matters raised is listed for 9 to 17 December 2015.¹³⁴
76. On 29 July 2015, Ofcom published a statement¹³⁵ indicating that, having carried out a high level assessment, Ofcom had no reasonable grounds for believing that BT is contravening, or has contravened, the SMP condition requiring BT to maintain a minimum VULA margin for the period 1 to 30 April 2015.
77. With regard to the accounting specifications, in May 2014 Ofcom published a statement making changes to BT's Regulatory Financial Reporting framework.¹³⁶ This statement sets out a number of changes to the way regulatory financial reports are prepared and provided, in response to a number of concerns raised with the previous system. Ofcom submitted that the changes

¹²⁸ [Ofcom response to issues statement](#), paragraph 6.11.

¹²⁹ [FAMR 2014](#), Volume 1, section 12.

¹³⁰ [FAMR 2014](#), Volume 1, paragraphs 12.147–12.150.

¹³¹ Ofcom (19 March 2015), [Fixed Access Market Reviews: Approach to the VULA margin](#).

¹³² [British Telecommunications Plc v Office of Communications \(case number: 1238/3/3/15\)](#).

¹³³ [TalkTalk Telecom Group Plc v Office of Communications \(case number: 1237/3/3/15\)](#).

¹³⁴ [Ofcom response to issues statement](#), paragraph 6.12.

¹³⁵ Ofcom, [BT's compliance with the VULA margin control](#).

¹³⁶ Ofcom (20 May 2014), [Regulatory Financial Reporting: Final Statement](#).

proposed would be implemented across all regulated markets, and were applied in the WLA (and WBA) markets in the June 2014 market reviews.¹³⁷

78. Ofcom also set out in the 2014 FAMR Statement that, in response to wider concerns expressed by several stakeholders that the BT SoR process is not working effectively, it decided to closely monitor the SoR process over the following 12 months. Ofcom has extended the period for this monitoring, and is currently considering whether to extend it further.¹³⁸ This is also noted in Ofcom's Strategic Review of Digital Communications discussion document.¹³⁹

Future developments in the regulation of WLA

79. The CMA understands from Ofcom that it is currently scoping the analysis to be undertaken for the next WLA market review. Ofcom told us that it would consider, among other issues, whether defining a single market for standard and superfast broadband was still appropriate at the retail and wholesale level (along with other questions about geographic and product market definition), and which remedies may be appropriate if market power is established in any such markets.¹⁴⁰
80. As set out in the 2014 FAMR Statement, Ofcom anticipated that it would revisit the issue of whether to regulate the level of NGA prices in its next market review. Factors that Ofcom may consider include the presence of a constraint from copper (or other services), the risk of regulatory failure, and the extent to which superfast broadband has matured (for example, whether demand, technology and/or costs are more certain but also whether there remain future potential investments eg speed upgrades).¹⁴¹

Current WBA regulation

81. Ofcom's most recent review of the WBA market was completed in June 2014 and covers the period until 31 March 2017. It found that BT had SMP in the supply of WBA in Market A, which covers 9.5% of premises. In order to address this, Ofcom told us it imposed a number of conditions on BT in Market A.¹⁴² This included a charge control on WBA services offered in Market A. This was supported by a number of other general conditions

¹³⁷ [Ofcom response to issues statement](#), paragraph 6.14.

¹³⁸ [ibid](#), paragraph 6.15.

¹³⁹ [Strategic Review of Digital Communications: Discussion document](#), paragraph 11.39.

¹⁴⁰ [Ofcom response to issues statement](#), paragraph 6.16.

¹⁴¹ [ibid](#), paragraph 6.17. See also [Fixed access market reviews: wholesale local access, wholesale fixed analogue exchange lines, ISDN2 and ISDN30 Volume 1: Statement on the markets, market power determinations and remedies](#), paragraph 12.151–12.154.

¹⁴² [Ofcom response to issues statement](#), paragraph 6.18.

regarding transparency, non-discrimination, accounting separation, obligations for access to and use of specific network facilities, cost accounting obligations and further price controls.¹⁴³ Further details are set out in the 2014 WBA market review.¹⁴⁴

Future developments in the regulation of WBA

82. Ofcom submitted that it was currently scoping the analysis to be undertaken for the next WBA market review. It informed us that this would include assessing product market definition, including whether standard and superfast broadband remained in the same retail and wholesale market; whether separate geographic markets were still appropriate and if so what areas these should cover; and which remedies might be appropriate if SMP is established in any such markets. Regulatory remedies which might be appropriate include: transparency; non-discrimination; accounting separation; obligations for access to and use of specific network facilities; and price control (which may include cost based charge controls) and cost accounting obligations.¹⁴⁵

Regulation of wholesale and retail mobile markets

83. Ofcom confirmed that there was currently no regulation of retail mobile markets related to a finding of SMP.¹⁴⁶ Furthermore, Ofcom submitted that it did not have any current proposals to impose SMP regulation for retail mobile services (given that no MNO had been found to have SMP in the provision of retail mobile services either individually or jointly).¹⁴⁷ However, Ofcom told us that it did regulate upstream wholesale mobile voice call termination services (ie the service needed by a CP to connect a voice call to the network of a mobile operator) and that its management of spectrum did also influence the retail mobile market.¹⁴⁸
84. Additionally, there is no obligation for MNOs to provide mobile wholesale services. Ofcom carried out a review of the market for wholesale access and call origination on public telephone networks in 2003 (when the market was still listed on the Commission's Recommendation on Relevant Markets) and concluded that no undertaking had SMP, either individually or in combination

¹⁴³ [Ofcom response to issues statement](#), paragraph 6.18.

¹⁴⁴ Ofcom (26 June 2014), [Review of the wholesale broadband access markets: Statement on market definition, market power determinations and remedies](#).

¹⁴⁵ [Ofcom response to issues statement](#), paragraph 6.9.

¹⁴⁶ [ibid](#), paragraph 3.7.

¹⁴⁷ [ibid](#), paragraph 3.8. Ofcom submitted that it would keep this under review in accordance with its duties under the CRF and CA03.

¹⁴⁸ [Ofcom response to issues statement](#), paragraphs 3.7 & 3.8.

with one another.¹⁴⁹ The market for wholesale access and call origination on public telephone networks was removed from the Commission's Recommendation on Relevant Markets in 2007. Therefore, if Ofcom were to conduct a market review of this sector with a view to imposing SMP regulation, if required, it would have to justify doing so by demonstrating that the 'three criteria test' was met.¹⁵⁰ Ofcom submitted that it also had no plans to regulate the wholesale access and call origination market.¹⁵¹

¹⁴⁹ [Ofcom response to issues statement](#), paragraphs 4.16 & 4.17.

¹⁵⁰ [ibid](#), paragraph 4.18.

¹⁵¹ [ibid](#), paragraph 4.16.

Transaction and merger rationale

Introduction

1. This appendix sets out the details of the transaction and merger rationale and comprises the following sections:
 - (a) Background to the transaction.
 - (b) Summary of the terms of the acquisition.
 - (c) Financial effects of the transaction.
 - (d) Financing the acquisition.
 - (e) Post-acquisition arrangements with Deutsche Telekom and Orange.

Background to the transaction

2. On 15 December 2014, BT announced that further to its statement on 24 November 2014,¹ it had entered into an exclusivity agreement with DT and Orange in relation to BT's possible acquisition of all of their UK mobile business, EE.²
3. BT and the Sellers signed a sale and purchase agreement (the SPA) for the entire issued share capital of EE on 5 February 2015.³
4. In view of its size, the transaction constitutes a Class 1 transaction for the purposes of the Listing Rules, and therefore requires shareholder approval.⁴ On 1 April 2015, BT issued a Circular (BT Circular) to holders of BT's Ordinary Shares recommending that shareholders vote in favour of the transaction.⁵ BT held a General Meeting of shareholders on 30 April 2015,

¹ On 24 November 2014, BT stated that it noted the recent press speculation relating to a potential transaction involving Telefónica UK (O2) in the UK. BT said it continued to develop its own plans for providing enhanced mobile services to business and consumer customers, in line with previous announcements and that it remained confident of delivering on these plans and had also been exploring ways of accelerating them, including assessing the merits of an acquisition of a mobile network operator in the UK. BT stated that it had received expressions of interest from shareholders in two UK mobile network operators, of which one was O2, about a possible transaction in which BT would acquire their UK mobile business. BT stated that all discussions were at a highly preliminary stage and there could be no certainty that any transaction will occur. See BT press release (2014): [Response to recent press speculation](#).

² See BT press release (2014): [BT enters into exclusive negotiations to acquire EE](#).

³ See BT press release (2015): [BT agrees definitive terms to acquire EE for £12.5bn to create the UK's leading communications provider](#).

⁴ [BT Circular \(1 April 2015\)](#), p4.

⁵ BT (2015), [Proposed acquisition of EE Limited: Circular to Shareholders and Notice of General Meeting](#).

and announced on 7 May 2015 that shareholders had approved the proposed acquisition.⁶

5. BT expects the transaction to complete before the end of BT's 2015/16 financial year (31 March 2016).⁷
6. Completion of the transaction is conditional upon satisfaction, or where capable of being waived, waiver of several conditions prior to the long stop date of 5 August 2016 (or such later date as the parties may agree).⁸ The SPA includes a condition that completion of the transaction is subject to clearance under the UK Enterprise Act 2002 from the CMA.⁹ The SPA will terminate (and completion will not occur) if any remedies required by the CMA in order to obtain merger clearance are not reasonable (unless BT, DT and Orange agree to waive this condition).^{10,11} For details of other conditions precedent see Annex A.

Summary of the terms of the acquisition

7. Under the terms of the SPA, BT will (subject to the satisfaction or waiver of certain conditions)¹² acquire the entire issued share capital of EE for a purchase price equivalent to £12.5 billion on a debt and cash free basis.¹³ BT expects that EE's existing borrowings, totalling £2.1 billion as at 31 December 2014, will remain outstanding at completion. Based on £2.3 billion of adjusted net debt, being EE's net debt as above adjusted for other debt-like items, and using the reference price of 411.5 pence per Ordinary Share (the closing price

⁶ See BT press release (2015): [BT Group Plc results for the fourth quarter and year to 31 March 2015](#).

⁷ [BT Circular](#), p6.

⁸ [BT Circular](#), paragraph 2.

⁹ See Clause 3.1(d) of the SPA. BT states that for the avoidance of doubt, DT's acquisition of a 12% shareholding in BT does not constitute a 'concentration' for the purposes of German merger control, and is not conditional upon German merger control clearance (see Clause 3.1(e) of the SPA). DT's right to nominate a non-executive director to the BT board is conditional upon compliance with any applicable regulatory requirements (Clause 5.1 of the Relationship Agreement; see also Clauses 4.4 to 4.6 of the SPA). BT does not consider that this right will confer 'competitively significant influence' on DT for the purposes of German merger control, and therefore constitute a concentration, because of the restrictions on the right that are provided for in Clause 6.2 of the Relationship Agreement. BT told us that this analysis was confirmed by the German Federal Cartel Office on 30 April 2015, which confirmed that DT's acquisition of a 12% shareholding and right to nominate a director is not notifiable in Germany.

¹⁰ [BT Circular](#), p6.

¹¹ The transaction is conditional upon there having been no material adverse change (as defined in the SPA) in relation to BT and EE. See [BT Circular](#), paragraphs 2(f) & 2(g).

¹² For example, if the Board of BT had changed its recommendation that Shareholders vote in favour of the transaction prior to the vote taking place and Shareholders had not approved the transaction, or if BT recommends an alternative transaction prior to completion and the transaction does not proceed to completion as a result, then DT and Orange can terminate the SPA and BT shall pay a break fee of £250 million (in aggregate) to DT and Orange. Source: [BT Circular](#), p6.

¹³ [BT Circular](#), p5.

on 4 December 2014), the remaining consideration would be satisfied by BT as follows:

- (a) £5.1 billion to DT comprising around 1.2 billion new Ordinary Shares and cash of around £200 million (which is subject to further variation in accordance with a cap and collar mechanism described below).
 - (b) £5.1 billion to Orange comprising around 0.4 billion new Ordinary Shares and cash of around £3.4 billion (which is subject to further variation in accordance with a cap and collar mechanism described below).¹⁴
 - (c) The SPA contains a cap and collar protection mechanism, which provides for an adjustment to the cash element of the consideration (but not the share element) where there is a movement in the Ordinary Share price from the reference price.¹⁵ See Annex A for further detail.
8. On the basis of the above, DT will acquire a 12% shareholding in BT and will be entitled to appoint one non-executive director to the BT board of directors for as long as DT holds an interest in BT's ordinary shares of 10% or more; and Orange will acquire a 4% shareholding in BT. Following the Transaction, BT will have legal control of EE for the purposes of section 26 of the Enterprise Act 2002. No other shareholder will have control over EE.

Financial effects of the transaction

9. BT estimates that after taking into account the effect of the transaction on the net assets of BT, the enlarged Group would have net assets of £7.8 billion at 31 December 2014 on a pro forma basis.¹⁶ For further details, see Annex A.
10. Adjusting for the net present value (NPV) of operating cost and capex savings estimated by BT, the transaction values EE at a multiple of six times 2014 EBITDA.¹⁷ The valuation multiple is calculated on the acquisition price of £12.5 billion less the NPV of the operating cost and capex savings (after integration costs) of approximately £3 billion (see below for further details) and EE adjusted EBITDA for the 12 months to 31 December 2014 of £1,589 million (adjusted to remove management and brand fees of £146 million, restructuring costs of £77 million and exceptional expenses of £336 million).¹⁸

¹⁴ BT Circular, p6.

¹⁵ As measured over a defined period of time prior to completion.

¹⁶ BT Circular, p6.

¹⁷ BT Circular, p7.

¹⁸ BT Circular, p7, footnote 2.

11. We consider that the agreed acquisition price largely reflects the underlying value of the standalone EE business. This is supported by BT's internal documents that [REDACTED],¹⁹ and the first strategic element of BT's rationale for the merger (the acceleration of BT's mobility strategy).²⁰
12. BT estimates an aggregated NPV of cost and capex savings together with revenue synergies of around £5.1 billion pre-integration costs. Of the cash flow projections supporting BT's NPV calculations, around [REDACTED] relate to cross-selling between fixed and mobile activities (or vice versa).²¹ Cost savings are mainly driven by eliminating duplicative fixed costs relating to procurement, IT and network savings. See below for further details.
13. BT expects the transaction to lead to higher adjusted EPS that would have been the case without the transaction in the second year post-acquisition.²² BT's presentation to analysts on 5 February 2015 indicated it expected the transaction to increase free cash flow per share in the first full year post-completion and for return on invested capital (ROIC) to comfortably exceed BT's WACC in the third full year post-completion.²³

Cost savings

14. The BT Circular states that:
 - (a) the acquisition is expected to generate significant operating cost savings and additional capex savings, together expected to reach approximately £360 million per annum in the fourth full year post-completion;
 - (b) integration costs to achieve these savings are expected to be around £600 million; and
 - (c) cost savings are equivalent to a net present value of around £3.5 billion before integration costs or around £3 billion after integration costs.²⁴
15. The BT Circular also provides a breakdown of the cost and capex savings as follows:

¹⁹ See [REDACTED].

²⁰ [BT initial submission](#), paragraph 4.2(a).

²¹ CMA calculation based on £[REDACTED] of revenue synergies ([REDACTED]% of £1.6 billion) over a base of £5.1 billion (total NPV from cost and capex savings and revenue synergies, pre integration costs). See Table 7.

²² [BT Circular](#), p7.

²³ See [BT slides](#), p18.

²⁴ [BT Circular](#), p7.

- (a) Commercial savings with an annual run-rate of approximately £70 million from consolidating sales and marketing operations, procurement efficiencies and simplifying digital platforms and the brand portfolio.
- (b) IT savings with an annual run-rate of approximately £90 million through consolidating IT systems and insourcing activities.
- (c) Network savings with an annual run-rate of approximately £80 million through integrating some network elements and insourcing certain activities.
- (d) Operational savings with an annual run-rate of approximately £120 million from consolidating head office functions, rationalising property and realising scale economies in customer service operations.²⁵

16. BT told us that its forecasts for cost and capex savings and integration costs include [REDACTED]. Comparing the figures from the BT Circular with a BT internal presentation dated January 2015, which contains a bottom-up analysis of savings, suggests that cost and capex savings figures announced publically by BT for the fourth year post-completion are [REDACTED].

Table 1: [REDACTED]

[REDACTED]

Source: [REDACTED]

17. [REDACTED]²⁶

Table 2: [REDACTED]

[REDACTED]

Source: [REDACTED]

[REDACTED]

18. [REDACTED]

Network cost savings

19. BT's plans for network cost savings [REDACTED].

- [REDACTED]

20. [REDACTED]

²⁵ BT Circular, p7.

²⁶ [REDACTED]

21. [REDACTED]^{27,28}

22. [REDACTED]

23. [REDACTED]²⁹

Integration costs

24. As set out below, BT has quantified integration costs associated with generating the cost savings it has identified. Comparing figures from BT's Circular with BT's internal bottom-up analysis of integration costs suggests that figures announced publically by BT for total integration costs of around £600 million [REDACTED].

Table 3: [REDACTED]

Source: [REDACTED]

25. [REDACTED]

Table 4: [REDACTED]

Source: [REDACTED]

[REDACTED]

Revenue synergies

26. In addition to cost savings, BT's Circular indicates that it expects to generate revenue synergies over and above the revenue it had expected to be generated from its standalone mobile strategy, with an NPV of around £1.6 billion.³⁰

27. BT's calculation of revenue synergies is based on the following assumptions: [REDACTED].

28. BT expects to generate revenue synergies from the following sources:

(a) Selling BT's broadband, fixed telephony and pay TV services to those EE customers that do not currently take a service from BT.

(b) Selling converged fixed-mobile services to its existing consumer and business customers.

²⁷ MBNL is a joint venture owned 50% by EE and 50% by H3G.

²⁸ [REDACTED]

²⁹ [REDACTED]

³⁰ [BT Circular](#), p7.

(c) Offering new services using both companies' product portfolios, skills and networks.³¹

29. Internal BT analysis indicates that revenue synergies [REDACTED].

Table 5: [REDACTED]

Source: [REDACTED]

[REDACTED]

30. [REDACTED]³²

[REDACTED]

31. [REDACTED]

32. [REDACTED]

Table 6: [REDACTED]

Source: [REDACTED]

33. [REDACTED]

Figure 1: [REDACTED]

[REDACTED]

Source: [REDACTED]

34. [REDACTED]

Total revenue synergies

35. Table 7 shows a breakdown of BT's forecast revenue synergies in Year 5 post-merger.

Table 7: Breakdown of revenue synergies Year 5, incremental free cash flow

[REDACTED]

Source: [REDACTED]

Financing the acquisition

36. BT intends to finance the cash consideration to be paid to DT and Orange of approximately £3.6 billion (see above) through a combination of the net

³¹ BT Circular, p7.

³² [REDACTED]

proceeds of BT's equity placing undertaken on 17 February 2015, which raised proceeds of approximately £1 billion, and new debt financing.³³ BT entered into a bridge facility agreement which provides for a facility of £3.6 billion at the time of signing the SPA.³⁴

37. BT has stated that it expects its credit rating will be at least maintained following completion.³⁵

Post-acquisition arrangements with Deutsche Telekom and Orange

38. The terms of the proposed relationship between BT and DT following completion are to be set out in an agreement between BT and DT, the form of which was agreed on 4 February 2015 and which will be executed on completion as a relationship agreement. For further details, see Annex A.
39. At completion BT will enter into a standstill and lock-up agreement with Orange SA and Orange, which will regulate the ability of the Orange Group to deal in shares and other securities of BT. For further details, see Annex A.

³³ [BT Circular](#), p8.

³⁴ [BT Circular](#), paragraph 9.1.4.

³⁵ [BT Circular](#), p8.

Annex A: Further detail

Conditions precedent

1. Completion of the transaction is conditional upon satisfaction, or where capable of being waived, waiver of several conditions prior to the long stop date of 5 August 2016 (or such later date as the parties may agree).³⁶ Conditions precedent (other than those that related to CMA clearance) include:
 - (a) BT's shareholders passing the resolution to approve the acquisition, and to grant BT's Directors specific authority to allot the new ordinary shares to be issued by BT to the Sellers pursuant to the SPA (the Consideration Shares);
 - (b) the UK Listing Authority approving the admission of the Consideration Shares to the Official List; and
 - (c) the London Stock Exchange having approved admission of the Consideration Shares to trading with effect from completion of the transaction.

Cap and collar mechanism

2. The SPA contains a cap and collar protection mechanism which provides for an adjustment to the cash element of the consideration (but not the share element) where there is a movement in the Ordinary Share price from the reference price,³⁷ subject to:
 - (a) a minimum share price of approximately 395 pence (being 4% below the reference price). A share price below this level would not result in further adjustment to the cash or share consideration and therefore the value of the transaction would fall below £12.5 billion; and
 - (b) a minimum share price of approximately 428 pence (being 4% above the reference price). A share price above this level would not result in further adjustment to the cash or share consideration and therefore the value of the transaction would increase above £12.5 billion.³⁸

³⁶ BT Circular, paragraph 2.

³⁷ As measured over a defined period of time prior to completion.

³⁸ BT Circular, p6.

Relationship Agreement with Deutsche Telekom AG and Deutsche Telekom

3. At Completion, BT will enter into a Relationship Agreement with Deutsche Telekom AG and Deutsche Telekom, which will regulate aspects of the ongoing relationship between BT, Deutsche Telekom AG and the Deutsche Telekom Group. This agreement will terminate if:
 - (a) BT's ordinary shares are no longer listed on the premium listing segment of the Official List and admitted to trading on the London Stock Exchange's main market for listed securities; or
 - (b) the Deutsche Telekom Group ceases to be interested in more than 3% of the issued ordinary share capital of BT.
4. The agreement covers a period of three years and, subject to certain exceptions, restricts the ability of Deutsche Telekom to increase its shareholding in BT above 12% within this period.

Standstill and Lock-up Agreement with Orange SA and Orange

5. The standstill and lock-up agreement between BT and Orange SA and Orange will regulate the ability of the Orange Group to deal in shares and other securities of BT. This agreement will terminate if: (a) BT's ordinary shares are no longer listed on the premium listing segment of the Official List and admitted to trading on the London Stock Exchange's main market for listed securities; or (b) the Orange Group ceases to be interested in more than 3% of the issued ordinary share capital of BT.
6. The agreement covers a period of three years during which Orange, subject to certain conditions restricts the ability of Orange Group to increase its shareholding in BT above 4%.

Unaudited pro forma statement of BT/EE net assets

7. As stated in paragraph 9, BT estimates that after taking into account the effect of the transaction on the net assets of BT, the enlarged Group would have net assets of £7.8 billion at 31 December 2014 on a pro forma basis. See Table 1 below for details.

Table 1: BT B2B mobile revenue forecasts

UNAUDITED PRO FORMA STATEMENT OF NET ASSETS

	BT as at 31 December 2014 £m	Adjustments			Enlarged Group £m	
		EE as at 31 December 2014 £m	Equity Placing £m	Acquisition adjustments £m		Intra-group eliminations £m
	(Note 1)	(Note 2)	(Note 3)	(Note 4)	(Note 5)	
Non-current assets						
Intangible assets	3,082	9,789	–	1,906	–	14,777
Property, plant and equipment	13,584	2,242	–	–	–	15,826
Derivative financial instruments	935	7	–	–	–	942
Investments	42	–	–	–	–	42
Associates and joint ventures	26	3	–	–	–	29
Trade and other receivables	151	22	–	–	–	173
Deferred tax assets	1,568	252	–	–	–	1,820
	<u>19,388</u>	<u>12,315</u>	<u>–</u>	<u>1,906</u>	<u>–</u>	<u>33,609</u>
Current assets						
Programme rights	196	–	–	–	–	196
Inventories	103	77	–	–	–	180
Trade and other receivables	3,235	1,294	–	–	(30)	4,499
Current tax receivable	23	–	–	–	–	23
Derivative financial instruments	27	2	–	–	–	29
Investments	2,170	–	–	–	–	2,170
Cash and cash equivalents	593	52	1,000	(1,000)	–	645
	<u>6,347</u>	<u>1,425</u>	<u>1,000</u>	<u>(1,000)</u>	<u>(30)</u>	<u>7,742</u>
Current liabilities						
Loans and other borrowings	1,737	37	–	2,568	–	4,342
Derivative financial instruments	74	10	–	–	–	84
Trade and other payables	5,053	2,184	–	71	(30)	7,278
Current tax liabilities	252	–	–	–	–	252
Provisions	111	204	–	–	–	315
	<u>7,227</u>	<u>2,435</u>	<u>–</u>	<u>2,639</u>	<u>(30)</u>	<u>12,271</u>
Total assets less current liabilities	18,508	11,305	1,000	(1,733)	–	29,080
Non-current liabilities						
Loans and other borrowings	7,737	2,087	–	–	–	9,824
Derivative financial instruments	859	26	–	–	–	885
Retirement benefit obligations	7,895	159	–	–	–	8,054
Other payables	916	18	–	–	–	934
Deferred tax liabilities	937	–	–	–	–	937
Provisions	405	204	–	–	–	609
	<u>18,749</u>	<u>2,494</u>	<u>–</u>	<u>–</u>	<u>–</u>	<u>21,243</u>
Net (liabilities)/assets	(241)	8,811	1,000	(1,733)	–	7,837

Source: BT Circular, p78.

Retail mobile

1. This appendix sets out information on retail mobile services, supplementary to that set out in Chapters 10 to 12, under the following headings:
 - (a) Market shares.
 - (b) Consumer mobile.
 - (c) Business mobile.
 - (d) Possible effects of BT's spectrum in the counterfactual other than through BT's retail presence.
 - (e) Effects on competition if the merged entity were to gain additional customers.

Market shares

2. Table 1 shows each operator's share of subscribers, data and calls carried, and of retail revenue. It shows that [REDACTED] H3G has customers whose data use [REDACTED]. EE and Vodafone have [REDACTED].

Table 1: Retail market shares, Q4 2014

Operator	%			
	Subscribers	Data	Calls	Revenue
EE	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
BT	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
BT (with EE)	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
Telefónica	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
Vodafone	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
H3G	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
All MVNOs	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
Virgin Media	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
Tesco*	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
Others	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]

Source: Parties and third parties

*50:50 joint venture with Telefónica.

Note: [REDACTED]

3. Table 2 sets out more detail on subscriber shares. It shows that BT has had a stable recent market share of [REDACTED]%, driven by a share of around [REDACTED]% in business mobile, and no presence in consumer mobile until very recently.

Table 2: Shares of subscribers in retail mobile as of December 2014

Operator	%				
	2012 (overall)	2013 (overall)	2014 (overall)	2014 (business including M2M)	2014 (consumer)
EE	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
BT	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
BT (with EE)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Telefónica	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Vodafone	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
H3G	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Virgin Media	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Tesco*	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Others	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

Source: Parties and third parties.†
 *50:50 joint venture with Telefónica.
 †[redacted]

4. Ofcom also provided data on shares of data and revenues over time. This showed that MVNOs’ share of subscribers [redacted], while their share of revenue [redacted]. Their shares of data carried [redacted]. Over time, the subscriber share of Virgin Media, the largest MVNO, [redacted]; its share of data and revenue [redacted]. H3G, the smallest MNO, saw its revenue share grow from [redacted]. H3G’s share of subscribers grew from [redacted] to [redacted] between 2010 and 2014.¹

Consumer mobile

Drivers of competition

5. The parties submitted that:
- (a) price, network quality and customer service are the key factors driving competition between operators in the UK market; and
 - (b) as a result of high levels of investment in the UK market, all MNOs and many MVNOs offer 4G services and all MNOs are aiming to deliver 4G coverage to 98% of the population by the end of 2015, although data speeds alone are not key to winning customers.
6. Both the parties and third parties submitted past survey evidence on the factors affecting consumers’ decisions to change provider, and what they consider important when choosing a new provider. It appears that:
- (a) when leaving a provider, price is the most common motivator (see Table 3); and

¹ Ofcom (2015), *Mobile call termination market review 2015-18: Statement on the markets, market power determinations and remedies*, p124.

(b) a survey asking customers about the factors affecting their choice of new provider found that [REDACTED].

Table 3: Reasons for changing provider

		%	
<i>What key factor motivated you to leave your previous mobile provider? (Analysys Mason)</i>		<i>What prompted you to start looking for a new provider? (Ofcom)</i>	
Price	40	Reviewing finances	17
Poor coverage	16	Advertisement for a better deal	23
Poor customer service	10		
Poor data speed	2		
Different package	8	Poor service from provider	35
Handset choice	6	Wanted new handset	2
To be on the same network as peers	4	Friend/family had a better deal	8
Other	14	Wanted to add more services	9
		End of contract period	17
		Moving home	1
		Other	10

Source: Analysys Mason (2014), *The consumer experience of 2014*, submitted by the parties, H3G and Vodafone; Ofcom, *The consumer experience of 2014: research report*, Figure 162.

Table 4: Factors that are important when choosing a network

Factors	Switchers	All
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]

Source: [REDACTED]

Notes:

1. Figures rebased from scale where 1= not at all important and 5 = most important.
2. Base mobile phone owners 16+ on contract tariffs; switchers comprise the subset of users that switched operators in the 24 months to May 2014. This is a weighted score. Scoring for this is on a scale of 0-5. Each score is then weighted to give an overall index score out of 100. The possible answers are 1-5. 1 denotes 0, 2 denotes 25, 3 denotes 50, 4 denotes 75 and 5 denotes 100.

7. The parties emphasised:

- (a) the low proportion (in the Analysys Mason survey in Table 3) of customers switching because of poor data speeds; and
- (b) a further finding that relatively few respondents to a survey considered data speed to be the most important factor in determining network quality (as shown in Table 5).

Table 5: The most important factor for the quality of the network

Factor	%
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]

Source: [REDACTED]

Note: this is a percentage group of customers who selected quality as most important.

8. H3G also submitted information from its own monitoring of its 'Net Promoter Score' based on [REDACTED].

Competitor monitoring in relation to consumer mobile

9. [redacted] submitted internal documents showing that they monitor each other’s offerings (as well as giffgaff (a sub-brand of Telefónica), and Tesco Mobile (a joint venture with Telefónica)), and that to a lesser extent they also monitor Virgin Media and in some instances TalkTalk and BT. [redacted]

10. EE provided internal documents showing its monthly assessments of its competitors. Table 6 shows the number of months that EE operators were ranked as ‘best in class’ for various characteristics relevant to pay-monthly and pay-as-you-go consumer customers, based on responses to consumer surveys. This choice of metrics appears to emphasise the importance of brand and marketing investments as drivers of competition. [redacted]

Table 6: [redacted]

Metric	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]†	[redacted]
[redacted]*	[redacted]	[redacted]
[redacted]	[redacted]‡	[redacted]‡
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]

Source: [redacted]

- *[redacted]
- †[redacted]
- ‡[redacted]

11. EE also monitors consumers’ perceptions of network quality, along with other criteria. [redacted], Appendix G (Spectrum) includes a more detailed comparison of the MNOs’ networks, which includes a number of quality metrics against which H3G performs well.

Figure 1: [redacted]

[redacted]

Source: [redacted]

- Notes:
1. [redacted]
 2. [redacted]

12. We also received evidence on what the MNOs consider to be relevant sub-segments of consumers – some of which relates to their attitudes to data. For example:

(a) [redacted]

(b) When looking at how data use varies across consumers, H3G segments customers into: [REDACTED].

(c) [REDACTED]

(d) Vodafone submitted that [REDACTED].

13. Vodafone submitted evidence that in its consumer research, [REDACTED]. [REDACTED]

Table 7: [REDACTED]

[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]

Source: [REDACTED]

14. As set out in Table 7 above, EE considers that 4G is important to some customers. In relation to the data speeds that can be offered, the parties submitted that all MNOs are able to offer 'basic' 4G services. The parties told us that they 'recognise that there are some customers (in both the business and consumer segments) that place value on having access to mobile data speeds that are even faster [...]. As a result, EE and Vodafone have both invested in LTE-advance (LTE-A) technology which they are rolling out at present'. For more discussion of data speeds, see Appendix G (Spectrum).

15. In relation to the amount of data that customers use, information on customers' average data use per month suggests that H3G is the strongest competitor for high data-use customers. For H3G customers, average usage is [REDACTED] GB/month; for EE it is approximately [REDACTED] GB/month (2015 year to date); for Vodafone it is around [REDACTED] GB/month; and for Telefónica it is [REDACTED] GB/month.

Consumer mobile sales channels

16. One further driver of competition that was highlighted by the parties is the sales channels used by operators. They argued that physical stores are

important for meeting customer demand. This is supported by a comment from Enders Analysis that:

It is also worth noting the continued strength of physical shop sales compared to online, with shops representing 59% of total contract sales. This is one reason that MVNOs without a physical retail presence – say, broadband operators – struggle to gain traction in the mobile market.

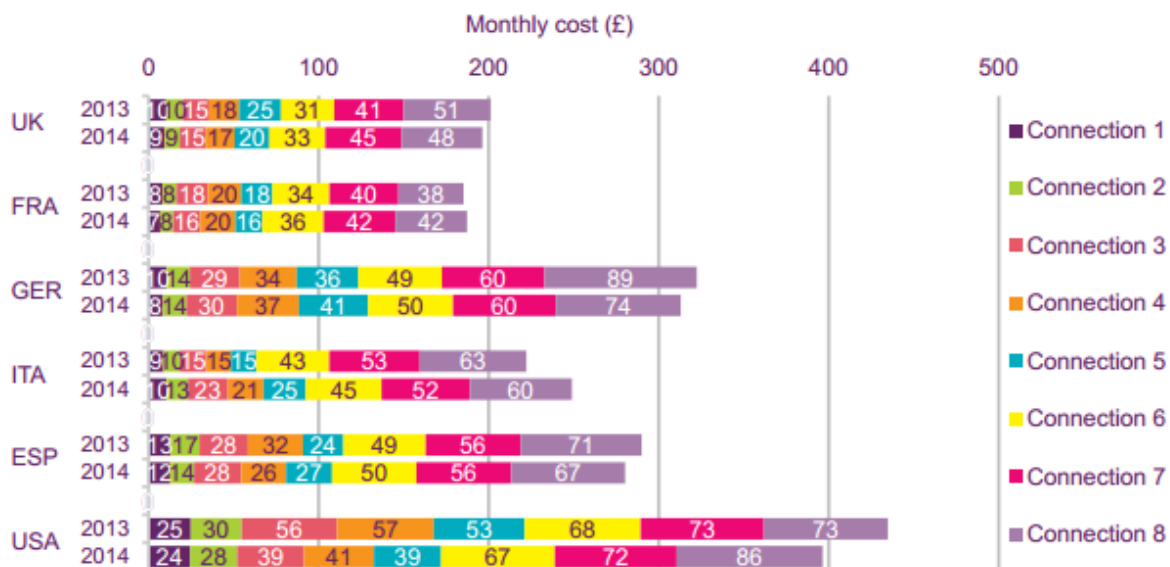
17. The MNOs make around [X]% of their consumer sales through their own retail stores; Virgin makes around [X] of its mobile consumer sales through this route.
18. Telefónica told us that retail stores are ‘very important to enable customers to directly experience devices when purchasing them and to interact more easily when seeking help for problems with their devices, compared with discussions remotely online or over the phone’.² On this point, BT noted that absent the merger, BT as an MVNO does not have a retail store presence. According to BT, this could not be changed without BT incurring very high costs. BT submitted that ‘absent the merger BT would lack this important sales channel and could not differentiate its propositions on the basis of in-person customer service’.

Comparison of European retail mobile markets

19. The parties submitted evidence suggesting that both prices and EBITDA margins are lower in the UK than in many other EU countries.

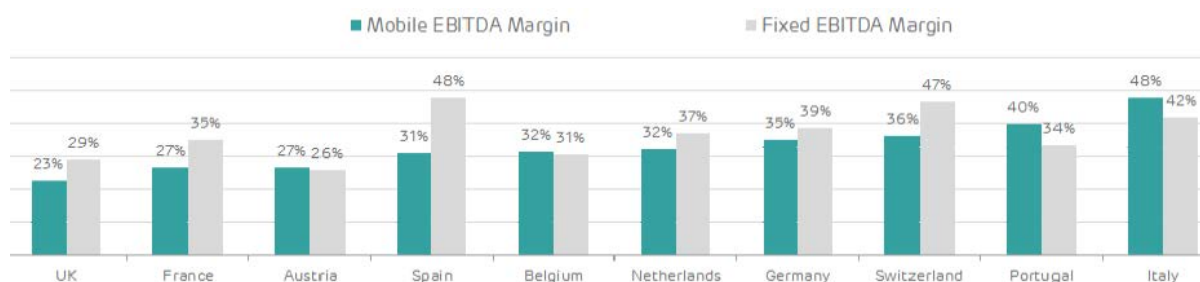
² [Third party hearing summaries](#)

Figure 2: Comparative stand-alone weighted average mobile pricing



Source: Ofcom (using data supplied by Teligen), *International Communications Market Report (2014)*, Figure 2.5.
 Note: The eight connections reflect different combinations of handset and data, voice and text message usage, to reflect a range of typical households. This sets out the weighted average of best-value tariff from each of the three largest operators by market share in each country from any of the three largest operators by market share in each country, July 2013 and July 2014; PPP (Purchasing Power Parity) adjusted.

Figure 3: EBITDA margin comparison across European markets in 2013



Source: Credit Suisse. *European Telecoms Factsheet, Q1 2014*.

BT’s entry into consumer mobile

20. As shown in Table 8, since the launch of BT’s consumer mobile proposition, it has gained proportions of market-wide consumer additions which are [X].

Table 8: Shares of gross additions, consumer segment, FY 2015/2016

	Consumer segment		
	March	April	May
EE	[REDACTED]	[REDACTED]	[REDACTED]
O2	[REDACTED]	[REDACTED]	[REDACTED]
Vodafone	[REDACTED]	[REDACTED]	[REDACTED]
H3G	[REDACTED]	[REDACTED]	[REDACTED]
BT	[REDACTED]	[REDACTED]	[REDACTED]
Virgin Media	[REDACTED]	[REDACTED]	[REDACTED]
TalkTalk	[REDACTED]	[REDACTED]	[REDACTED]
Assuming market-wide additions (million) of	[REDACTED]	[REDACTED]	[REDACTED]

Source: Operators.

21. Table 9 shows the proportion of BT's customers gained from each source. This evidence suggests that BT is [REDACTED].

Table 9: BT's gained customers by source, 2015

	March	April	May	Market share for comparison
				%
EE	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
Telefónica (incl. giffgaff)	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
Vodafone (incl. Talk Mobile)	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
H3G	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
Virgin	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
Tesco	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
TalkTalk	[REDACTED]	[REDACTED]	[REDACTED]	
Asda	[REDACTED]	[REDACTED]	[REDACTED]	
Sainsbury's	[REDACTED]	[REDACTED]	[REDACTED]	
Other	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]

Source: BT – excluding customers marked as having been ported in from BT.

22. BT's initial gains in consumer mobile were noted by several third parties.³ For example, Virgin Media submitted that 'BT reports that it has signed up 50,000 customers in the six weeks since the launch of the service,^{4,5} saying that 'BT therefore already represents a new and significant competitive force in the mobile market'.⁶
23. We received some submissions which argued that BT's launch of consumer mobile had been less aggressive than it would have been had it not anticipated the merger.
24. We asked BT about any changes it had made to its retail plans as a result of its anticipated merger. It submitted that it had made a number of revisions to its plans over the time period in which the merger was in contemplation, but

³ See, for example, [Ofcom response to issues statement](#)

⁴ See BT press release (May 2015): '[BT Group plc results for the fourth quarter and year to 31 March 2015](#)'.

⁵ We note that BT subsequently published that it gained 100,000 customers in the first three months. See BT (July 2015), [Financial results: results for the first quarter to 30 June 2015](#).

⁶ [Virgin Media initial submission](#), paragraph 6.3.

these were almost entirely driven by other considerations. BT submitted comments on five aspects of its launch, as set out below:

- (a) On tariff pricing and allowances (of minutes, texts and data), [REDACTED].
- (b) On the possible launch of alternative or additional propositions [REDACTED].
- (c) On budgets for technological developments, [REDACTED].
- (d) On budgets for marketing spend, [REDACTED]. [REDACTED]:
 - (i) [REDACTED]
 - (ii) [REDACTED]
- (e) On its expectations of market share, [REDACTED].

Business mobile

25. Earlier, we set out market shares data provided by BT showing that in 2014 its share of business mobile was approximately [REDACTED]% (see Table 2). The parties also provided estimates of market shares within sub-segments of business customers, which show that BT's presence is similar across businesses with fewer or more than 100 subscribers (see Table 10).

Table 10: Market shares in business sub-segments

	<i>Smaller UK business segment*</i>	<i>Larger UK business (corporate) segment (including public sector)†</i>	<i>Overall combined business mobile market share</i>	%
Total connections	Approx. 3.4 million connections	Approx. 8.6 million connections	Approx. 12 million connections	
Vodafone	[REDACTED]	[REDACTED]		[REDACTED]
Telefónica	[REDACTED]	[REDACTED]		[REDACTED]
EE	[REDACTED]	[REDACTED]		[REDACTED]
BT	[REDACTED]	[REDACTED]		[REDACTED]
Virgin Media	[REDACTED]	[REDACTED]		[REDACTED]
H3G	[REDACTED]	[REDACTED]		[REDACTED]

Source: Parties.

*Up to 100 subscribers.

†101 subscribers upwards.

26. Although BT has been present in business mobile since 2001, it launched a new proposition, OnePhone, in July 2014. Table 11 shows that BT's share of gross additions within the business segment has been around [REDACTED]% in March to May 2015. Table 12 shows that [REDACTED].

Table 11: Shares of gross additions in business mobile, 2015

	%		
	<i>March</i>	<i>April</i>	<i>May</i>
EE	[X]	[X]	[X]
O2	[X]	[X]	[X]
Vodafone	[X]	[X]	[X]
H3G	[X]	[X]	[X]
BT	[X]	[X]	[X]
Virgin Media	[X]	[X]	[X]
TalkTalk	[X]	[X]	[X]
Assuming market-wide additions (millions)	[X]	[X]	[X]

Source: Operators.

Table 12: BT's gained customers by source, business mobile

	%			
	<i>March 2015</i>	<i>April 2015</i>	<i>May 2015</i>	<i>Market shares for comparison</i>
EE	[X]	[X]	[X]	[X]
Telefónica (incl. giffgaff)	[X]	[X]	[X]	[X]
Vodafone (incl. Talk Mobile)	[X]	[X]	[X]	[X]
H3G	[X]	[X]	[X]	[X]
Virgin	[X]	[X]	[X]	[X]
Tesco	[X]	[X]	[X]	[X]
TalkTalk	[X]	[X]	[X]	
Asda	[X]	[X]	[X]	
Sainsbury's	[X]	[X]	[X]	
Other	[X]	[X]	[X]	[X]

Source: BT – excluding customers marked as having been ported in from BT.

27. Given that BT is the joint [X] provider of business mobile services, below we set out information on BT and other providers of these services, and their future plans, in order to help our assessment of the importance of the constraint provided by BT in the counterfactual. This includes information on their positions in relation to fixed services, and their ability to offer technically converged services and meet other requirements of businesses since, as set out in Appendix H (Fixed-mobile bundles) these factors may become more important for business customers over time.
28. **Vodafone** is the largest provider of business mobile services, with an overall share of around [X], [X] in smaller UK businesses and [X]% in the 'enterprise segment' (ie the largest businesses). In an internal document, BT describes Vodafone as [X] in the 'corporate segment' (similarly, the largest businesses). [X] Vodafone owns Cable & Wireless and therefore owns fixed infrastructure, although its share of retail business broadband is very small. Vodafone has a technically converged fixed-mobile product called One Net.⁷ BT submitted that Vodafone can meet any requirement set out by any

⁷ See the Vodafone [One Net](#) webpage.

customer in any segment of the business market, mobile or fixed (or combined).

29. **Telefónica** is also a strong competitor in business mobile, with an overall share of around [X]% and a similar share across small and large businesses. An internal document of BT's describes Vodafone and Telefónica as [X] in medium enterprises. Telefónica estimates its own market share in business as shown in Table 13.

Table 13: Telefónica's estimate of its market share across business segments

Business size	%	
	<i>Subscriber</i>	<i>Billed revenue</i>
	Q4 2014	Q4 2014 (last 12 months)
[X]	[X]	[X]
[X]	[X]	[X]
[X]	[X]	[X]
[X]	[X]	[X]

Source: [X]

*Figures are broken down by number of connections, as a proxy for employee numbers.

30. Telefónica does not have its own fixed infrastructure and it provides broadband services to businesses using BT inputs. In relation to technically converged products, Telefónica submitted that: 'Providers of converged solutions do not necessarily need to own both sets of infrastructure but there are clear economic benefits to doing so as they are often sold in combination with the underlying connectivity'. Telefónica argued that 'competitive wholesale access to BT's network is necessary to allow innovative service providers that do not own communications infrastructure to compete in a segment that will experience a further uptake of converged solutions in the future' and that 'this trend [X]. Guaranteeing competitive access to national fixed infrastructure would make it viable for a wider range of service providers to compete and drive service innovation'.
31. [X] The question of access to fixed infrastructure is considered as part of Chapter 18 (broadband inputs) and Chapter 16 (mobile backhaul, which includes discussion of access to sites for small cells). BT submitted that Telefónica is in a position to meet almost all, if not all the requirements of any customer.
32. **EE** has a business [X]. EE also provides business broadband services⁸ using BT inputs, but has a very small share ([X]). EE does not offer a converged fixed and mobile product for small businesses, with the exception

⁸ See EE's [business broadband](#) webpages.

of its 'EE Pocket Landline service' product, which is targeted at SOHO⁹/microbusinesses. This provides customers with a landline number that forwards calls to their mobile and a single voicemail. [REDACTED]

33. An internal document from Vodafone discussing the business segment noted that [REDACTED].
34. **BT's** current share of business mobile subscribers is [REDACTED]% and is slightly higher for large businesses; it has forecast an overall share of around [REDACTED]% by 2018/19 with a slightly lower share in large businesses. BT has a share of [REDACTED]% in business broadband, and [REDACTED] (by revenue) of SME broadband. BT has a converged product called One Phone.
35. Vodafone submitted that BT is one of its main competitors for smaller SMEs, and that in relation to fixed products, it is a main competitor for corporate and public sector customers. Vodafone also commented, in relation to mobile, that 'it is just when it goes to unified comms that it gets a little bit different. [REDACTED]'. An internal document submitted by Vodafone presented the results of a survey of lost business customers, and showed that [REDACTED].
36. Telefónica submitted that 'in fixed connectivity, BT is the clear leader'.
37. EE note [REDACTED].
38. Figure 4 shows an EE chart that assesses the strengths of BT against those of EE, Vodafone, and Telefónica, and against EE's analysis of business customers' preferences (based on five business customers won by each operator, for whom EE had also competed). The same document states that 'to date that Vodafone and O2 have been the most at risk' although also that they have 'sufficient ammo in the armoury to negate BT's advances in retail services'.

Figure 4: [REDACTED]

[REDACTED]

Source: [REDACTED]

39. **H3G** submitted that it has [REDACTED] in the business mobile segment, serving [REDACTED] of all business subscribers. H3G also does not provide fixed services.

⁹ Small office/home office.

40. **Virgin Media** has a share of business mobile of less than 1%.¹⁰ The parties submitted that this is driven by a [X] % share in small businesses only. In parts of the country Virgin Media's fixed infrastructure has comparable coverage to BT. Outside Virgin Media's fixed infrastructure footprint, it provides services to business by using BT Wholesale/BT Openreach inputs. Its retail share of business broadband for its non-SME customers is [X] %, or [X] % (by revenue) for SMEs.
41. Virgin Media plans to grow its sales to business customers. At present, Virgin Media resells EE products to 'enterprise customers' with more than 250 employees; [X] offer enterprise customers mobility solutions in addition to the mobile data and voice services resold on behalf of EE. To date, these mobility solutions have been primarily focused on offering professional services to enterprise customers to help them map out their mobility strategy. [X]
42. Virgin Media is a recent new entrant into the SOHO/SME sub-segment of the mobile retail market. [X] to offer certain mobile propositions to SOHO/SME customers that were launched commercially in June 2015. Virgin Media told the CMA that [X].
43. Virgin Media's longer term plans are linked [X].¹¹
44. BT submitted that Virgin Media is capable of meeting most of the requirements of any business customer, that they are very well placed to compete within the micro, small and medium sized business sectors especially, and that they have a strong presence in the provision of services to local government.
45. **TalkTalk** has a very small share in business mobile, and a [X] % share in business broadband. BT submitted that TalkTalk had a stated ambition of doubling market share of the SME market by 2017/18. TalkTalk does not have a bundled fixed and mobile offer for businesses, although it has some fixed infrastructure. In relation to technical convergence, BT highlighted that TalkTalk offered Talk2Go, which allowed customers to use existing fixed line minutes on their mobile free of charge, and that it would be launching femtocells in 2015. BT submitted that TalkTalk continued to challenge BT Business in all segments and across the portfolio.
46. **Sky** is not present in business broadband, [X].

¹⁰ Virgin Media submitted that it does not have any estimates or forecasts in terms of its share of individual sub-segments. Given its relatively recent entry into the mobile business segment, Virgin Media estimates that its current share is very low (with approximately [X]), which is less than [X] % of its addressable business customers.

¹¹ Virgin Media's Virtual Private Network service.

47. BT submitted that it also faced a large number of **other competitors** in the provision of business mobile, although the combined market share of these operators in business mobile was very small. Table 14 and Table 15 summarise the information BT provided on competitors outside those listed above.

Table 14: Business sub-segments

<i>Segment (employees)</i>	<i>Competitors</i>
Enterprise, including public sector/government (>1,000)	Vodafone, O2, EE, Verizon, AT&T, Tata, IBM, Accenture, HP, CSC, Virgin Media Business, COLT, Level 3, Logicalis, Azzurri, Daisy, Adept Telecom, Google, Microsoft
Corporate (250-1,000)	Gamma Telecoms, Daisy, Easynet, Vodafone, O2, Virgin Media Business
Mid-market (50-249)	Gamma, Daisy, Easynet, 3, Vodafone, O2, Virgin Media Business
Small business (10-49)	TalkTalk Business, 3, XLN, Vodafone, O2, Virgin Media Business
Micro (1-9)	TalkTalk Business, 3, XLN, Vodafone, O2, Virgin Media Business

Source: Parties.

Table 15: Other competitors in business

	<i>Easynet</i>	<i>Gamma</i>	<i>Daisy</i>	<i>XLN</i>	<i>Capita</i>	<i>Verizon</i>	<i>Azurri</i>
Focus	Corporate and large enterprise	Sells directly to corporate businesses and public sector and indirectly to smaller businesses	Initially focused on SME/mid-market, now competes in large corporate and public sector	Small businesses, esp. <10 employees. Also provides card processing and business energy. Claims to be 2 nd to BT business.	Focused on data analytics and cloud based infrastructure	Tier 1 globally (across services below)	Primarily mid-market
Core mobile services	EE reseller	MVNO through O2	O2 and Vodafone reseller	SIMO mobile	No	No standard offer in UK, but can work with MNOs to provide bespoke solution	O2 and EE (including FMC services)
Calls and lines	VOIP only	Strong in business telephony; [X] in UK business VOIP market	✓	Simple landline	Via BT	Comprehensive	Via multiple partners
Internet Access	Comprehensive	Grew its broadband connections by [X] in 2014/15	[X]% share in SME broadband by revenue*	Simple broadband	Connectivity, storage and backup	Comprehensive	Full range via partners
VPN	✓	No info provided	No info provided		✓	✓	✓
Collaboration services	Full offering	No info provided	✓		✓	✓	✓
Cloud services	Full offering;	No info provided	✓		✓	✓	✓
Contact centre solutions	No info provided	No info provided	No info provided		✓	Expansion into UK planned?	✓

Source: BT.

48. Telefónica also highlighted a number of competitors, including MVNOs such as 'Exponential-e, Daisy and many others'; 'resellers [...] particularly active in the mid-market'; 'IT services providers who provide managed services and OTT applications that rely on telecommunications infrastructure'; and for multinational customers a smaller set of competitors (aside from BT and Vodafone who are strong in this segment) including Verizon, ATT and Orange Business Services.
49. Bidding data that BT provided to the CMA relating to April 2014 to August 2015 supports the idea that these operators are not currently competing strongly in business mobile (as suggested by market shares). Among [REDACTED] occasions when BT recorded who it was competing against, in only [REDACTED] cases (6%) did this include someone other than Vodafone, EE and Telefónica. [REDACTED]
50. An internal document submitted by BT highlights a number of MVNO competitors in business mobile, and notes that 'currently, [BT does] not have much competition from MVNOs, [REDACTED]'. [REDACTED]
51. Insofar as fixed-mobile bundling or technical convergence, becomes important for businesses, it does appear plausible that the importance of smaller mobile providers will grow, given that in business broadband, [REDACTED]% of the market is made up of operators outside the list above.
52. This is supported by Telefónica, which submitted that 'the telecommunications sector in the UK is undergoing a number of structural changes driven by supplier consolidation and the demand for converged experiences. Furthermore, technology such as Unified Communications, which aims to offer a converged experience between mobile and fixed, further blurs the traditional distinction between fixed and mobile operators and provides opportunities for new entrants from adjacent sectors such as IT Services'.

Possible effects of BT's spectrum in the counterfactual other than through BT's retail presence

53. We have reviewed evidence on whether BT's spectrum could have exerted a competitive constraint in the counterfactual through BT selling of wholesale spectrum capacity to other operators.
54. [REDACTED]
55. BT told us that [REDACTED].
56. [REDACTED]

57. We received mixed responses from the MNOs on the question of whether they considered that BT would have been a credible supplier of capacity to them.
58. Vodafone told us that ‘as Vodafone understand it, BT’s “inside-out” strategy would still have left BT dependent on EE for national mobile coverage outside of those areas that BT could self-supply. Vodafone has no visibility of BT’s plans and intentions beyond what is in the public domain but are not aware that BT considered itself as a potential wholesaler of mobile services in the counterfactual’. Vodafone also stated that ‘it is not clear that BT would have had the ability or the intention to act as a national wholesaler in the counterfactual. Therefore, Vodafone has not considered purchasing capacity from BT’.
59. H3G told us that it considers that BT could have been a credible wholesaler of mobile services/network access with its pre-merger strategy, and [REDACTED]. However, H3G noted that [REDACTED]. H3G also highlighted that BT had approached it in the past regarding access to its [REDACTED].
60. Telefónica confirmed that it ‘considered the feasibility of using BT’s publicly announced “inside-out” network plans and the possibility of BT wholesaling capacity thereon’. However, Telefónica also submitted the following:
- TUK¹² questioned the financial viability of the proposals at the time, even with BT’s superior economics, and the operational feasibility of providing material capacity offload and an acceptable customer experience.
- TUK concluded that BT would [REDACTED]. Therefore, TUK would have no confidence in this being a viable solution.
- [REDACTED]
61. Telefónica submitted that it also considered an alternative model [REDACTED], but again concluded the technical complexity was too high.
62. As noted earlier, [REDACTED]. However, [REDACTED].
63. Moreover, [REDACTED].

¹² Telefónica UK

Effects on competition if the merged entity were to gain additional customers

64. As set out in Chapter 12, we received some submissions which argued that competition would be harmed through improvements in the merged firm's capabilities, especially in relation to spectrum, relative to the counterfactual. One mechanism that we considered, through which harm to competition could occur as a result of such improvements, was the possibility that, by losing customers to the merged firm, competitors could be substantially weakened relative to the counterfactual. Below we set out evidence received on:

- (a) the relationship between customer numbers and competitive strength;
- (b) the relationship between spectrum and customer numbers; and
- (c) whether customer switching to EE could cause such concern.

The relationship between customer numbers and competitive strength

65. We received some submissions arguing that customer numbers may affect investment (and by implication competitive strength). For example, [redacted]. Similarly, [redacted] submitted that:

[redacted]

66. However, among the four MNOs, H3G has substantially lower share than its rivals (at around 9% compared to above 20% for the others), and yet has been an important competitive constraint (see Chapters 10 and 11). Ofcom has presented, for example, evidence that H3G has been winning similar shares of post-pay customers to O2 and Vodafone.¹³

The relationship between spectrum and customer numbers

67. Telefonica submitted that 'in a mobile market in which operators have deployed national coverage, such as the UK, capacity and market share becomes strongly correlated with spectrum holding' and supported its argument with information on European MNOs' spectrum and markets shares. This appears to confirm that Telefonica's market share is high, relative to that achieved by other operators with similar shares to Telefonica of spectrum in the countries where they operate. However, it also shows that across countries, operators with similar shares of subscribers vary quite widely in the market shares they hold. Operators in the UK carry subscriber and data shares which differ significantly from their share of spectrum.

¹³ See [Ofcom's 2015 statement on mobile call termination \(MTR\) charges](#), figure 11.

Whether customer switching to EE could cause such concern

68. We first considered the scale of possible benefit to EE that could be provided by the increase in its spectrum holdings following the merger, and then considered the maximum scale of customer switching this could cause. We understand that these benefits relate to the overall amount of spectrum that the merged entity will be able to employ for 4G, and the maximum carrier bandwidth that it can employ, including through carrier aggregation.
69. The merger provides EE with around a 20% increase in its spectrum holdings overall, and within those bands that are currently used in the UK for 4G spectrum.¹⁴ Third parties argue that this would allow EE to offer higher speeds, and/or more cheaply add additional customers without degrading speeds.¹⁵ We note the following:
- (a) Our understanding is that, holding other factors constant, if EE were to employ 20% more spectrum at all sites it could allow a 20% increase in traffic without affecting the speeds offered to existing customers (or potentially provide increases in speeds while holding customers constant).
 - (b) EE argues [REDACTED].
 - (c) The merger also provides EE with opportunities for additional carrier aggregation, which affects carrier bandwidth and speeds on uncongested sites (see Appendix G). However, we note that (a) over time, with refarming, EE would, in any event have been able to achieve similar carrier bandwidth to that which the merged entity could achieve, (b) EE already has much greater aggregation possibilities than its competitors, and (c) [REDACTED].¹⁶
70. This suggests that these additional aggregation opportunities may have limited merger specific effects. We therefore consider that a 20% increase in EE's customer numbers as a result of additional spectrum advantages provided by the merger (proportionate to the increase in its spectrum) is the upper bound of what we consider to be relevant.

¹⁴ These are currently 800 MHz, 1800 MHz, and 2.6 GHz (paired/FDD), although in principle other spectrum could be 'refarmed' to carry 4G (or put into use directly, as in the case of 2.6 GHz (unpaired/TDD) spectrum). We expect that this will happen over time.

¹⁵ See, for example, [Vodafone initial submission](#) paragraph 7.30 – although Vodafone argued that while this is true in theory (compared to the merged entity's spectrum constrained competitors) the merged entity would either have little incentive to do so, or will only do so at significantly higher prices compared to premerger.

¹⁶ The parties submitted that following the merger, EE would be able to [REDACTED].

71. Should such an increase occur, EE's market share would grow by around 7 percentage points. If customers were gained from other MNOs in proportion to their market shares, this would cause:
- (a) O2 to lose [X] percentage points of market share, to [X]% overall;
 - (b) Vodafone to lose [X] percentage points of market share, to [X]% overall;
and
 - (c) H3G to lose [X] percentage point of market share, to [X]% overall.
72. Moreover, any switching may be unlikely to occur quickly, which could give competitors greater opportunity to respond. For example, H3G provided data on the tenure of its customers, which suggests that while around [X]% of customers switch each year, the median tenure [X] years and around [X]% of customers have not switched [X] years. For other operators, these figures are generally [X].

Spectrum, capacity, and speed

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Introduction

1. This appendix sets out:
 - (a) background on the role of spectrum and its effect on the service that operators offer;
 - (b) a discussion of alternative network investments that can to an extent be a substitute for spectrum;
 - (c) an assessment of spectrum in the 1.4 GHz band that has recently been traded and spectrum in the 2.3 GHz and 3.4 GHz bands that is due to be auctioned soon; and
 - (d) the evidence we have received about possible capacity constraints, taking into account existing spectrum holdings, planned and possible network investments, and potential purchases of spectrum.

Background on spectrum

2. Third parties have argued that the merger between BT and EE will have important implications due to its effect on holdings of mobile spectrum. Some third parties have also argued that other MNOs [] are or will be weaker competitors than EE in the retail and (particularly) wholesale mobile markets, because their spectrum holdings are inferior to EE's.
3. Mobile spectrum is the portion of the electromagnetic spectrum that has been licensed by Ofcom for mobile use. While there is range of frequencies that

could in principle be used for mobile, in practice the allocated frequencies have grown over time as Ofcom has moved other uses out of particular bands (that is, portions of spectrum). Ofcom has a principal duty to further the interests of citizens and consumers, where appropriate by promoting competition, which it applies in relation to spectrum where it also has a duty (among others) to promote its efficient use.¹

4. In general, parts of each mobile band (for example, 2x10 MHz in a specific segment of the 2.1 GHz band) are allocated to particular mobile operators. Earlier, this was by an administrative allocation; more recently it has been by auction. As new spectrum has become available over time, it has been put into use using the most recent transmission technology. Once in use, there are costs to 'refarming' spectrum from one technology to another. Hence, at present the operators use 2G, 3G and 4G technology in different bands, although it is theoretically possible to use 4G technology (also known as 'long term evolution' or LTE) in any mobile band. Operators do not use all of their spectrum at all of their cell sites, but will tend to use more spectrum at busier sites.
5. Within a mobile network, there are a number of 'cells' which cover a geographic area. A cell site or base station is a site on the radio access network (RAN). A site may (through 'sectorisation') have multiple cells.
6. Spectrum carries calls and data between cell sites and phones, using channels, which are multiplexed into carriers of (in the case of 4G) up to 20MHz of contiguous spectrum. These carriers can in turn be aggregated. At the moment, two-carrier aggregation is in use in the UK. EE has plans to employ three-carrier aggregation,² [📶]. It is possible to aggregate carriers if they are in the same band; inter-band aggregation is also possible across some bands, and the number of carriers and scope for aggregation will increase with time (for example to include aggregating spectrum in which frequency division duplexing³ (FDD) is used, with spectrum in which time division duplexing (TDD) is used; and aggregation across licensed and unlicensed spectrum).⁴

¹ [Ofcom Decision to make the 700 MHz band available for mobile data, section 3, November 2014.](#)

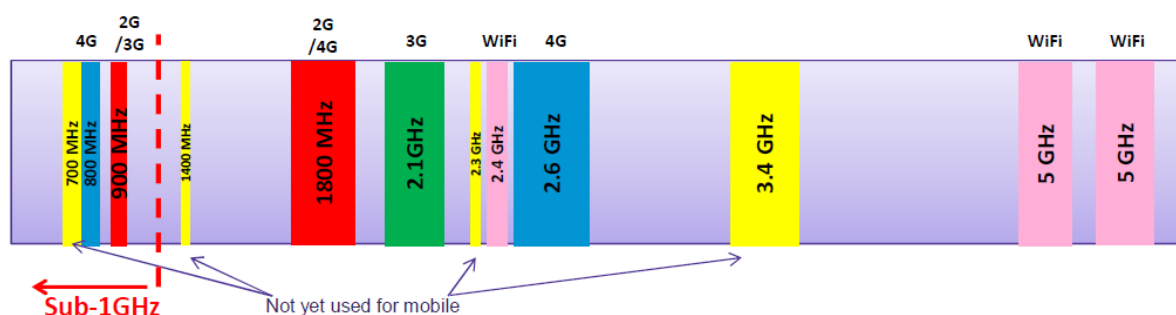
² EE has already showcased its 400 Mbit/s service achieved by combining three LTE carriers – 20 MHz of 1800 MHz spectrum, 20 MHz of 2.6 GHz spectrum, and a further 15 MHz of 2.6 GHz spectrum. See [EE's website for the news story.](#)

³ The means by which signals moving between two elements in opposite directions are separated.

⁴ See documents on the [website of 3GPP](#) (3rd generation partnership project).

7. Where cell sectorisation is employed, the same block(s) of spectrum can be re-used at a single site, which expands capacity. Currently three sectors are the norm. Some operators have deployed six sectors at some sites.
8. In contrast to the majority of mobile spectrum, which is allocated to individual operators and can be used at relatively high power, data can also in principle be transmitted to and from mobile devices using:
 - (a) licensed spectrum that is limited to low power use. BT and Vodafone hold some of this spectrum, although it is not currently in use for mobile transmission;⁵
 - (b) shared, licensed spectrum. (TalkTalk and BT hold a small amount of such spectrum); and
 - (c) unlicensed spectrum used for Wi-Fi (this is also low power).
9. Figure 1 shows the most important bands in use for mobile (or due for release for mobile use).

Figure 1: Mobile spectrum



Source: Parties

Note: different colours indicate the means by which licences to use the spectrum were or will be assigned: red = originally assigned administratively, green = 3G auction, blue = 4G auction; yellow = recently traded (in the case of 1400 MHz) or due to be auctioned (2.3 GHz, 3.4 GHz, and 700 MHz); pink = licence exempt (Wi-Fi).

10. As part of its Public Sector Spectrum Release (PSSR), Ofcom plans to auction spectrum in the 2.3 GHz and 3.4 GHz bands, which the Ministry of Defence has now released to Ofcom.⁶
11. At present, the majority of mobile spectrum is 'paired spectrum' licensed for use using FDD – which means that some spectrum frequencies are allocated to uplink and some to downlink. Some spectrum in the 2.6 GHz band (which

⁵ Ofcom has excluded this low power spectrum from its calculation of relevant mobile spectrum for assessing future mobile spectrum caps – see [Ofcom's 2.3 and 3.4 GHz November 2014 consultation](#) at footnote 81.

⁶ [Ofcom \(26 October 2015\), Public Sector Spectrum Release \(PSSR\) Statement](#). Ofcom later decided that it would not commence the auction process 'until the European Commission has taken its decision as to whether the proposed merger between Telefónica UK Limited and Hutchison 3G UK Limited is compatible with the common market.' (communication released on 3 December 2015).

has already been released) and all spectrum in the 2.3 GHz and 3.4 GHz bands (due to be released in the short term) is 'unpaired' spectrum suitable for TDD, meaning that uplink and downlink is divided by time rather than frequency. The 1.4 GHz spectrum, which has recently been sold and is not yet in use, is 'supplemental downlink' (SDL) spectrum, meaning that it can only be used when paired with FDD uplink capacity.

12. As new spectrum is brought into use, it may necessitate changes being made to the operators' network infrastructure. The speed with which it is deployed and can begin to carry substantial traffic depends on the existence and prevalence of compatible mobile handsets. This in turn may depend in part on the extent to which the band is already used or due to be used in other countries, which will influence device manufacturers' decisions about when to incorporate into their devices the spectrum band in question.

How spectrum affects speeds and capacity

13. Based on submissions from the MNOs, we understand that holding all other factors⁷ constant:
 - (a) On parts of the network that are not heavily loaded, [⊗] – that is, the amount of spectrum that the operator can use together either because it is contiguous (up to 20MHz) or can be aggregated (currently up to three carriers of up to 20MHz each, or 60MHz in total).⁸
 - (b) Achieved speeds decline as the load on a cell increases, but this decline is non-linear and depends particularly on the quality of coverage received by the user – ie where the user is located in the cell.
 - (c) At loaded sites, contention between simultaneous users constrains the speeds experienced by users, to below the theoretical peak determined by carrier bandwidth. However, for a given level of simultaneous usage, speed is largely proportional to total 4G spectrum deployed.
 - (d) For a given speed and network size, peak capacity is largely proportional to total spectrum deployed.⁹

⁷ The actual speed an individual user might receive is influenced, among other things, by the number of simultaneous users in a cell (and the nature of their data usage), the capability of the customer's device, and the signal strength received by the customer at their current location (dependent on factors such as distance from the cell site, indoor depth, etc.), interference levels, scheduling, mobility, attenuation and terminal performance.

⁸ Spectrum bandwidth directly affects theoretical 'peak speeds', which are the theoretical maximum achievable by a single user close to the antenna.

⁹ Ofcom also submitted that 'holding fixed the amount of spectrum and the network, the addition of customers simultaneously trying to access a mobile cell will affect download and upload speeds.'

14. Additional spectrum can therefore be used to serve more simultaneous users at a certain level of data transfer speed, or provide a set number of users with higher speeds, or a combination of the two.
15. However, speeds can also be increased (and service quality improved) by:
 - (a) deploying more efficient (4G) technology (by deploying new spectrum or refarming spectrum used for 2G or 3G); and
 - (b) using methods that reduce the number of simultaneous users of each spectrum band at each cell, such as sectorisation, adding additional macro or small-cell sites, or encouraging offload to Wi-Fi (to the extent this is possible).
16. The rest of this appendix considers the evidence we have received on capacity constraints and congestion. It largely focuses on the extent to which consumers may face speeds that drop below operators' minimum targets, because we understand that these targets reflect thresholds which are likely to matter to a significant proportion of customers. We also note that when networks face congestion and can provide only low speeds, a range of related service measures are also affected including network availability and reliability.

The relationship between data volumes, customer numbers, and speeds

17. It is clear from the above that on a congested network, it could be possible to increase speeds by reducing the load on the network. In this section we consider how load, desired speeds and achieved speeds may be affected by:
 - (a) customer numbers; (b) the amount of data used by each customer; and
 - (c) the speeds demanded by the services used by customers.
18. Overall demand for data is expected to increase strongly over time.¹⁰ EE submitted that this is expected to be driven primarily by users spending more time on data intensive services, more than by increases in the data intensity or speeds demanded.¹¹ H3G submitted that the expected increases in data consumption cannot be solely as a result of increased penetration of, or time spent using, data services in general, but must implicitly assume increased usage of higher bandwidth (especially video) services.¹²

¹⁰ For example, Ofcom recently used a forecast that by 2030 levels of mobile data traffic before WiFi off-load could be more than 45x greater than today. See [Ofcom Decision to make the 700 MHz band available for mobile data, November 2014](#). See Chapter 5 for more detail.

¹¹ [EE hearing summary](#).

¹² [H3G response to the provisional findings](#), paragraph 35.

19. We understand that the capacity required on a network is determined by peak usage – ie the amount of data consumed by customers at peak hours - rather than by overall customer numbers or overall data usage. At a subset of sites, peak usage may be high enough to mean that at times of high use, speeds fall below operators' targets.
20. A customer will therefore have a particularly strong effect on necessary network capacity, and on speeds, if they use data at busy sites during peak hours (which vary but are usually in the evening). H3G told us that on its network, where there are simultaneous users, bandwidth is shared equally between them, so that a user demanding more data, or requiring higher speeds, does not affect other users' speeds more than other users in the same cell at the same time.
21. Some customer segments use substantially more data than others.¹³ The parties submitted that consumers' consumption of high quantities of data is more likely to be in their homes, and that this home location is less likely to be in capacity constrained city centres. This would imply that high data users are not strong drivers of necessary network capacity and that an operator may be able to provide a good service to high data users while having congested sites in city centres. Telefónica also submitted that [REDACTED]. It noted that while it didn't have information on where data is consumed by its high data use customers, data usage at home is generally likely to be over Wi-Fi (and so not impacting the network).
22. Telefónica also submitted that [REDACTED]. However, [REDACTED].
23. We therefore consider that the primary route by which large data packages could affect congestion would be if users who demand high quantities of data were more likely to use data at peak hours on busy sites than customers that use low quantities of data overall.
24. On the other hand, we note that users are more likely to experience reduced service quality in a congested network if they are using data (rather than voice, which is prioritised), and if they are using services that require high speeds (such as video streaming) or low latency¹⁴ (such as gaming). Telefónica submitted that such customers are likely to be highly profitable customers. These users may be more likely to be customers that use a lot of

¹³ [REDACTED]; H3G submitted that as at December 2014, [REDACTED] of data on its network is consumed by [REDACTED] of H3G's [REDACTED] customers [REDACTED].

¹⁴ A measure of responsiveness.

data. We therefore consider it possible that customers that demand high data packages may to an extent be more likely to be affected by congestion.

25. However, we note that EE estimates that median monthly data use across UK subscribers is below [X]GB per month, with 98% of users consuming less than [X]GB per month.¹⁵ Even among H3G customers, who have the highest average data use, the median usage for all customers¹⁶ is [X] and [X]% of all customers use up to 10GB.

Overarching comments received on capacity constraints and speeds

26. Broadly speaking, to alleviate (4G) capacity constraints at a particular site, operators can either employ more spectrum or make network investments. [X]

27. The parties submitted the following:

Provisioning for sufficient capacity in a network [] is a matter of effective forward planning to ensure congestion does not occur, taking into account the spectrum available to a MNO, the other options to build additional capacity and predicted increases in traffic across the network over time. MNOs are therefore in a position to build additional capacity well in advance of any constraints arising in particular areas. In this respect, a mobile network will not simply become 'capacity constrained' overall at a particular point in time, but individual cell sites may become more congested than an MNO would ideally like them to be. This does not mean that the MNO in question will have to stop serving existing or new customers in general (or even at that particular site). []

A small drop in performance at a site may be something that an MNO is willing to accept. [] To alleviate congestion in specific areas, deployment of small cells might be considerably cheaper than purchasing and deploying additional spectrum for national use. []

The parties do not consider it credible that any MNO would fail to provision sufficient capacity such that [it] would be unable either

¹⁵ Calculated on the basis that there are 83.4 million subscribers, and EE estimates that the 42 millionth subscriber falls in the interval of [X] per month. This is a conservative estimate: [X].

¹⁶ This is based on H3G's active consumer post-paid subscribers and 90-day active pre-paid subscribers as of December 2014. [X]

to serve its existing customers, or to take on any additional customers.

28. Telefónica submitted that [REDACTED]. Telefónica went on to argue that it ‘therefore does not have enough high capacity spectrum to act as a real competitive constraint in [REDACTED] segment of the market, and the aggregation of spectrum in the hands of the merged entity as a result of the Transaction makes it more likely that this position will be replicated across more segments in the medium term.’
29. Telefónica supported its position by highlighting that ‘Ofcom has also voiced concerns about the fact that very asymmetric spectrum holdings could have a negative impact on competition, noting that a reduction in competition could take place because (for example) an operator with a low spectrum share might not be able to compete quite as strongly for some customer segments’.¹⁷
30. H3G submitted that it [REDACTED].
31. Vodafone submitted that the merger will mean that the merged entity will have significant spare capacity, and that ‘Vodafone and the other MNOs will face significantly greater capacity constraints with regard to spectrum thereby constraining their ability to compete effectively with EE.’
32. UK Broadband submitted that in the short to medium term there will be real concerns over the availability of and potential concentration of spectrum capacity in the market – ‘EE already has more spectrum capacity than its competitors. Adding BT’s spectrum increases the merged firm’s higher capacity spectrum holdings by the addition of 30MHz of 2.6GHz FDD spectrum and 15MHz of 2.6GHz TDD spectrum. The merged firm’s extensive spectrum portfolio and dominance of the higher frequency spectrum bands means that it will have the ability to support a higher number of users than its competitors.’¹⁸
33. Ofcom told us that it did not expect operators to have equal spectrum holdings and recognised there could be quite significant asymmetry without it causing a competition concern. Indeed, there could be upside benefits to providers holding different spectrum amounts, because it might stimulate them to adopt different approaches to delivering their services, which could be beneficial.¹⁹

¹⁷ [Ofcom, Public Sector Spectrum Release \(PSSR\): Award of the 2.3 and 3.4GHz bands \(7 November 2014\)](#), paragraphs 7.47–7.48.

¹⁸ UKBroadband, Further submission following hearing

¹⁹ [Ofcom hearing summary](#)

34. Ofcom also submitted that ‘there has been and continues to be rapid growth in mobile data. MNOs have therefore added significant capacity in the past to cope with this, and will need to continue to do so in the future.’²⁰ Ofcom highlighted a number of ways for MNOs to increase their capacity, and submitted that:

[possible capacity constraints] would only be likely to raise a concern with the BT/EE merger if the other MNOs were unable to meet increasing demand on a sustained basis (as transitional capacity shortages that will soon be addressed are unlikely to pose a significant threat to competition). Longer term, we consider it unlikely this problem would arise. The different ways for MNOs to increase capacity may vary in terms of the speed with which they can be deployed and the amount of capacity they add. But, longer term, MNOs have available the full range of options for increasing capacity, including acquiring additional spectrum [], and we therefore consider that every MNO will have a reasonable opportunity to increase capacity.²¹

35. Telefónica subsequently responded to Ofcom’s submission, saying that [§].

Spectrum holdings

36. Figure 2 shows the distribution of holdings of mobile spectrum,²² currently and under the proposed mergers of BT and EE and of H3G and Telefónica. It includes 40MHz of SDL spectrum in the 1.4 GHz band that was recently sold by Qualcomm to Vodafone and H3G,²³ and TDD spectrum in the 2.3 GHz and 3.4 GHz bands that is due for auction by Ofcom.²⁴

37. The chart also shows the following:

- (a) The two safeguard caps that Ofcom imposed in the 4G auction in 2013, so as to limit the potential for highly asymmetric spectrum holdings and to minimise the risk that competitive intensity in the future might be lower than it otherwise would be. At that time, Ofcom imposed a limit on overall

²⁰ For further detail see the [2012 Real Wireless Report for Ofcom](#).

²¹ [Ofcom response to the issues statement](#)

²² Vodafone and BT have more unpaired 2.6 GHz than shown here but it is excluded, in line with Ofcom’s approach in its recent consultation on the PSSR spectrum auction, because of restrictions on it. The figure also excludes the low power shared ‘DECT Guard Band’ spectrum, and unpaired 1,900 MHz spectrum.

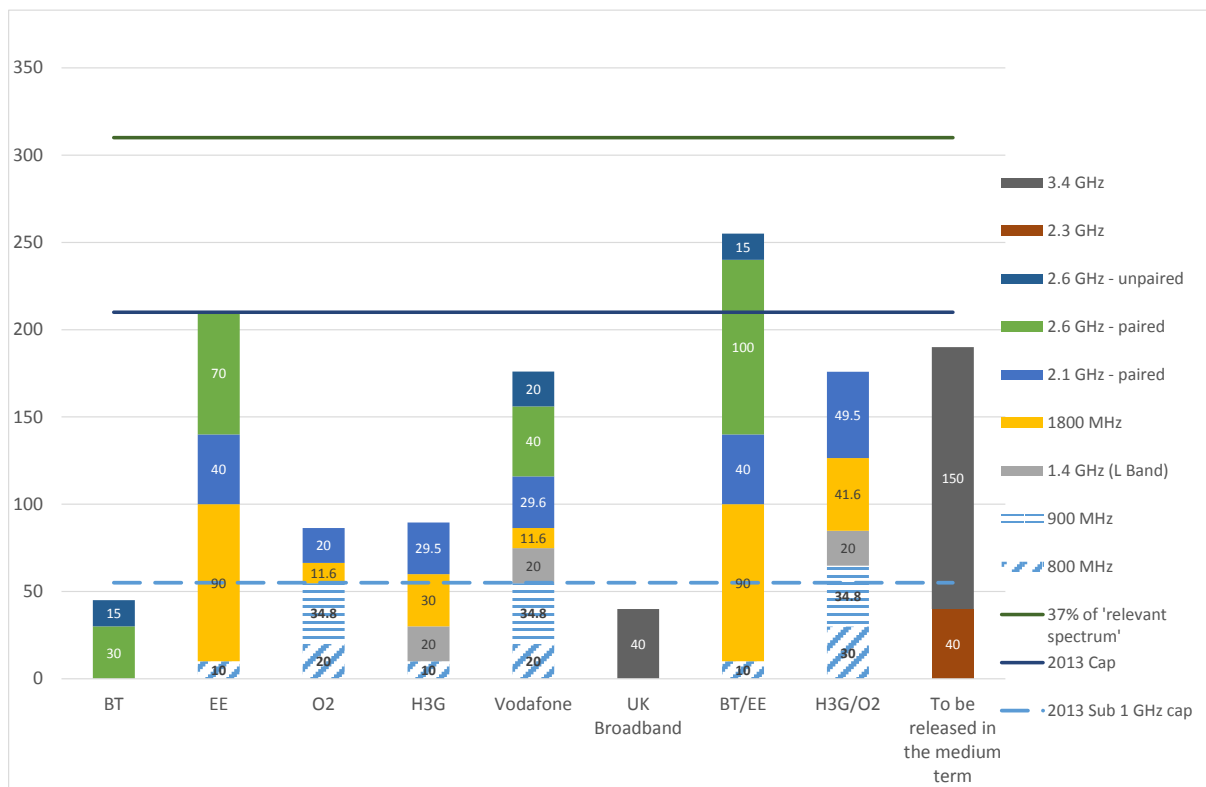
²³ On 22 September 2015, Ofcom approved this trade, of 40 MHz of spectrum at 1452–1472 MHz that will be suitable for mobile access in the future, from Qualcomm to Vodafone and H3G, with each obtaining 20 MHz of it. See Ofcom (2015), [Trade of frequencies in the 1452-1492 MHz band from Qualcomm UK Spectrum Ltd to Vodafone Limited and Hutchison 3G UK Limited](#).

²⁴ [Ofcom \(26 October 2015\), Public Sector Spectrum Release \(PSSR\) Statement](#).

holdings of spectrum of 2x105 MHz of available mobile spectrum, and 2x27.5 MHz of sub-1 GHz spectrum – the latter because of concerns that it may be important for a national wholesaler to have access to low frequency spectrum, because of its superior propagation characteristics which make it useful for providing coverage and in-building penetration.²⁵

(b) An amount, roughly equivalent to the previous overall holdings cap, recalculated as a proportion of ‘relevant spectrum’ as defined by Ofcom in relation to the forthcoming PSSR auction of 2.3 GHz and 3.4 GHz spectrum.²⁶ However, we note that in its decision on the PSSR auction, Ofcom decided not to impose a holdings cap.²⁷

Figure 2: Spectrum holdings January 2016



Source: Ofcom.

38. Figure 3 presents the MNOs’ shares of spectrum that has already been released, alongside market shares of subscribers, and of data carried. It shows that Telefónica carries [X], and that H3G [X].

²⁵ Ofcom (22 March 2011), *Assessment of future mobile competition and proposals for the award of 800MHz and 2.6GHz spectrum and related issues*, Annex 6, paragraphs 6.126 & 6.129.

²⁶ Ofcom (7 November 2014), *Public Sector Spectrum Release (PSSR): Award of the 2.3 and 3.4GHz bands*, paragraph 7.117. Note that the caps are expressed as a proportion of spectrum which Ofcom considered would be relevant to mobile access in future. This includes most mobile spectrum that has already been released, plus the spectrum in the bands due to be auctioned.

²⁷ Ofcom (26 October 2015), *Public Sector Spectrum Release (PSSR) Statement*.

Figure 3: Shares of spectrum, subscribers and data



Source: Ofcom.

39. The parties submitted that spectrum varies in value, with low frequency spectrum being particularly valuable because it has better propagation characteristics that make it useful for providing indoor and rural coverage, and provide cost savings by reducing the number of sites needed to provide a given level of coverage. This was supported by other operators, as well as by their internal documents from the time of, and the ultimate sale prices paid in, the 4G auction where both 800 MHz and higher frequency 2.6 GHz spectrum was traded. BT provided us with estimates of the value of each operator's spectrum holdings, based on Ofcom analysis and the results of the recent 1.4 GHz trade. It concluded that the operators' shares of spectrum by value would be as follows: BT/EE 33%, Vodafone 29%, Telefónica 22%, H3G 16%.²⁸
40. Table 1 shows how MNOs' spectrum volumes affect the amount of spectrum that each operator has available per customer and per TB of data carried. As noted earlier, we understand that on loaded networks, holding other factors constant, speeds are largely proportional to the amount of spectrum employed (for the relevant technology – ie 3G or 4G) per customer. Vodafone submitted that these figures were not relevant, both because they treated all spectrum as of equal value, and because data use would increase substantially in future.²⁹ However, we consider that they are helpful for considering the relative position of operators, particularly in the medium to long term as device development and refarming brings more spectrum into use for 4G.

²⁸ BT considered the intrinsic value of 800 MHz, 900 MHz, 1800 Hz and 2.6 GHz FDD spectrum to be of £33m/MHz, £18m/MHz, £13m/MHz and £5.5m/MHz, respectively, based on Ofcom Statement, 24 September 2015, 'Annual licence fees for 900 MHz and 1800 MHz spectrum'. BT considered the intrinsic value of 2.6GHz TDD spectrum to be of £0.49m/MHz, based on page 20, Annex 6, [Ofcom's analysis of 4G auction data](#). Finally, BT considered the intrinsic value of 2.1GHz spectrum to be £11m/MHz, based on Ofcom's estimate in the [Digital Communications Review of 2015](#).; BT estimated the value of the 1.4 GHz spectrum by scaling the reported UK £200m trade of 40MHz (8 year licence) to 20 years.

²⁹ Vodafone [response to provisional findings](#).

Table 1: Spectrum per subscriber and per MHz

	BT/EE	Telefónica	Vodafone	H3G
Mobile spectrum holdings 2015 (MHz)*	255	86.4	176	89.5
Subscribers, Q4 2014 (m)	[X]	[X]	[X]	[X]
Data carried, Q4 2014 (TB)	[X]	[X]	[X]	[X]
Spectrum (MHz) per m subscribers	[X]	[X]	[X]	[X]
Spectrum per TB of data carried	[X]	[X]	[X]	[X]

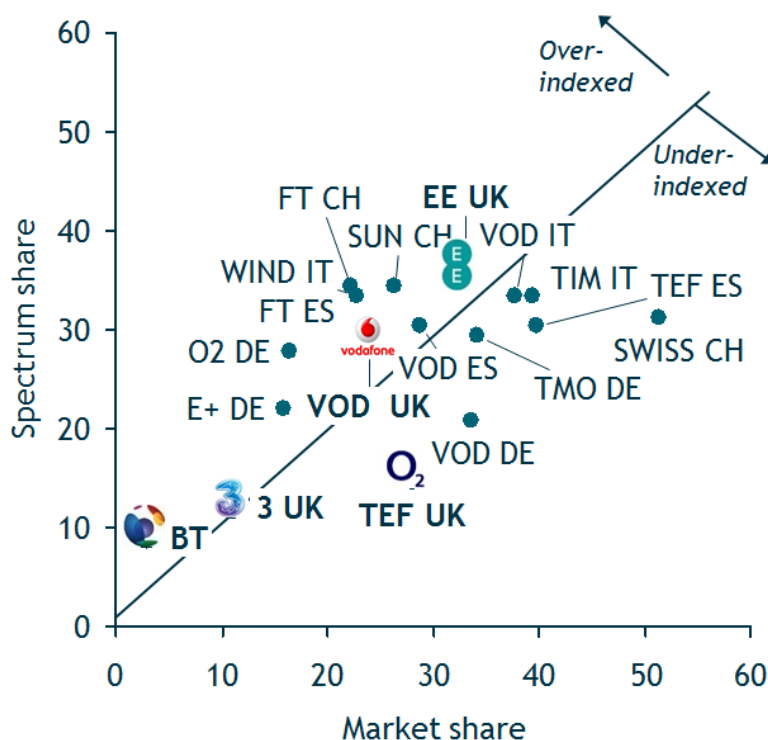
Source: Ofcom.

Note: figures relate to subscribers and data carried on the MNO's network, whether via retail or wholesale customers.

*Note that Vodafone and BT have more unpaired 2.6 GHz than shown here but it is excluded, in line with Ofcom's approach in its recent consultation on the PSSR spectrum auction, because of restrictions on it. It also excludes the low power shared 'DECT Guard Band' spectrum, and unpaired 1,900 MHz spectrum.

41. Telefónica submitted that 'In a mobile market in which operators have deployed national coverage, such as the UK, capacity and market share becomes strongly correlated with spectrum holding' and supported its argument with the following diagram (Figure 4) showing the distribution on European MNOs' spectrum and markets shares. This appears to confirm that Telefónica's market share is high, relative to that achieved by other operators with similar shares to Telefónica of spectrum, in the countries where they operate. However, it also shows that across countries, operators with similar shares of spectrum to one another vary quite widely in the market shares they hold.

Figure 4: Spectrum share versus market share, European MNOs



Source: Telefónica

42. For a given holding of spectrum, speeds and/or capacity can be increased through the following, which we discuss in turn:

- (a) Deployment of existing spectrum at more sites.
 - (b) Refarming of spectrum to 4G technology.
 - (c) Other network investments such as densification of sites and cell sectorisation.
 - (d) Purchase of additional spectrum.
43. Moreover, while additional spectrum may facilitate higher speeds, it is not clear that these higher speeds will always be necessary or valuable to consumers. We therefore conclude with a discussion of:
- (a) the extent to which customers value high speeds;
 - (b) how operators define and measure congestion – we consider that operators’ targets in this regard are likely to reflect speed levels that matter to consumers; and
 - (c) operators’ forecasts for congestion over time.

Rollout of more spectrum

44. Ofcom submitted that ‘MNOs can continue to increase their capacity by deploying spectrum they already hold that is currently not fully utilised. In particular, we understand that the MNOs are not yet fully utilising the 800 MHz and 2.6 GHz spectrum they acquired in the 4G auction in 2013. We expect this spectrum to play a large part in increasing capacity over the next few years’.³⁰
45. Operators confirmed that they have current plans in place to roll out their existing holdings of spectrum in order to deliver greater 4G coverage to the population. Telefónica said that it would reach 98% population coverage by the end of 2017; [redacted]; [redacted]; EE said that it delivered 4G coverage to 95% of the population by the end of 2015.

Refarming

46. As set out above, the amount of spectrum deployed for a particular technology can, holding customer numbers and other factors constant, affect speeds – directly at congested sites and at other sites indirectly, by affecting the amount of spectrum that can be aggregated. [redacted]

³⁰ [Ofcom response to issues statement](#)

47. Table 2 shows the total amount of spectrum the operators are currently using for 4G, and compares this to the amount of data and subscribers they support. It shows that:

(a) [REDACTED]

(b) [REDACTED]

Table 2: Spectrum used for 4G

	EE	Telefónica	Vodafone	H3G
Spectrum in use for 4G (on at least some sites) (MHz)	80	20	60	[REDACTED]
Proportion this makes up of all the operator's spectrum	38%	23%	34%	[REDACTED]
Operator's share of all spectrum in use for 4G in the UK	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
MHz in use for 4G, per 1,000 subscribers	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
MHz in use for 4G, per TB of data carried	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]

Source: Third parties

Note: EE currently uses 2x40 MHz of spectrum for 4G. EE has also announced plans to use its 2x5 MHz of 800 MHz spectrum by the end of 2015.

48. Where new spectrum is not available, operators may be able to refarm some of their existing spectrum from earlier technology to 4G. The advantage of refarming is that newer technologies will make use of existing spectrum more efficiently, increasing the capacity of MNOs in the process.

49. Table 3 shows how the operators and other parties are currently employing their spectrum across different technologies.

Table 3: Current spectrum holdings and usage

Frequency band	EE		Vodafone		Telefónica		H3G		BT		UKBroadband‡	MoD
	MHz	Technology	MHz	Technology	MHz	Technology	MHz	Technology	MHz	Technology	MHz	MHz
800 MHz	10	4G*	20	4G	20	4G	10	4G*				
900 MHz			34.8	2G, 3G	34.8	2G, 3G†						
1,452-1,492 MHz			20	4G*			20	4G*				
1,800 MHz	90	2G, 4G	11.6	2G	11.6	2G	30	4G				
2.1 GHz	40	3G	29.6	3G	20	3G	29.5	3G				
2.6 GHz paired	70	4G	40	4G					30	4G*		
2.6 GHz unpaired			20	4G					15	4G*		
2.3 GHz											40	40
3.4 GHz												150

Source: Ofcom

*Planned use of spectrum.

†[REDACTED]

‡UKBroadband uses its 40 MHz of 2.3 GHz spectrum to provide Relish (mobile broadband).

§The Ministry of Defence's spectrum will be auctioned in 2016 in the PSSR auction.

Note: Not all of the spectrum in each band may be deployed at the current time. See [Ofcom response to issues statement](#).

Also, this table does not include all the 50 MHz of unpaired 2.6 GHz spectrum as being relevant mobile spectrum. This is because the top 5 MHz of 2.6 GHz and the lowest 5 MHz of any individual company's holding in the unpaired 2.6 GHz band are restricted, to manage the risk of interference between users of unpaired spectrum as well as between users of unpaired spectrum and users of paired spectrum in neighbouring bands.

50. Vodafone argued that '4G-ready spectrum' is only that spectrum which is already used for 4G or which is unused (ie not used for 2G or 3G) and where current network and device availability and penetration is extensive (which it considered to be the case only for 800 MHz, 2,600 MHz FDD and that portion

of 1,800 MHz not currently being used for 2G).³¹ EE holds [redacted] of spectrum in this category, Vodafone [redacted], H3G [redacted], and Telefónica [redacted]. Other operators disagreed with this definition. For example, [redacted].

51. Ofcom stated that the most popular spectrum for refarming had been in the 900 MHz and 1,800 MHz bands, which were originally used for 2G services. The two operators with 900 MHz spectrum (Vodafone and Telefónica) had refarmed part of it for 3G, while 1,800 MHz had now partly been refarmed for LTE. In addition, while the operators currently found it more profitable to use 2,100 MHz for 3G, they would have the option of using it for LTE in the future.³⁴
52. One barrier to refarming is the number of customers with non-4G devices, and whether it is possible to re-farm spectrum while retaining a portion to support customers with these devices. For example, Vodafone submitted that ‘refarming is not straightforward, particularly because of the range of devices in the market and the requirement for backward compatibility’. It also said that because devices will normally seek their ‘highest’ available technology and 4G users often use 3G or 2G services for voice³² – ‘if 2G service is discontinued in an area, unless coverage is at least matched (as a minimum) by 3G, there will be a loss of service to 3G and 4G customers as well as to 2G customers’.
53. The operators provided us with estimates of the proportion of customers and data using each technology, as shown in Table 4.
54. The technology used by a given handset will depend on: (a) the technology for which the handset is enabled – for example, there is a lower number of 4G-enabled handsets than 3G-enabled); (b) the technology available to the handset at a given time and location – so, for example, operators that have not fully rolled out 4G will have higher 2G and 3G proportions.
55. This table shows that a substantial proportion of the devices in use today (carrying a substantial proportion of data) would be left without service if operators were to refarm all their spectrum to 4G. It may therefore be necessary for operators to maintain at least some spectrum for 3G use, for a significant duration.

³¹ Vodafone initial submission, paragraph 3.14 [redacted].

³² Although we note that voice over LTE (VoLTE) is now available, and that H3G has deployed it on 800 MHz, with EE to follow before the end of the year. However, there will still remain limitations in the number of compliant handsets.

Table 4: Devices on the operators' networks, 2015

		%		
		2G	3G	4G
<i>Devices on the network</i>	Telefónica†	[redacted]	[redacted]#	[redacted]#
	Vodafone	[redacted]	[redacted]	[redacted]
	EE	[redacted]	[redacted]	[redacted]
	H3G		[redacted]	[redacted]
<i>Data traffic carried on these devices</i>	EE	[redacted]	[redacted]	[redacted]
	H3G		[redacted]	[redacted]
<i>Data traffic carried on these technologies†</i>	Telefónica	[redacted]	[redacted]	[redacted]
	Vodafone	[redacted]	[redacted]	[redacted]

Source: Parties and third parties

Notes:

In this table 2G means 2G-enabled only devices; 3G means 2G and 3G capable devices; and 4G means 2G, 3G and 4G capable devices.

H3G data is for May 2015, Telefónica data for year-end 2014; [redacted].

†This data is presented as Telefónica and Vodafone did not provide data on the amount of data carried on devices that are compatible with each technology

#Approximation

56. However, all operators told us that they have plans for or are considering refarming their spectrum to 4G, including bands that no operator in the UK is currently using for 4G. Ofcom has also considered almost all the operators' current holdings as relevant mobile spectrum during its recent consultation in preparation for the upcoming auction of 2.3 GHz and 3.4 GHz spectrum.³³
57. Telefónica submitted that it [redacted]. It told us that its current use of spectrum [redacted]. However, Telefónica submitted that 'congestion is typically more prevalent in urban areas than rural areas, due to the volume of customers accessing the network in those areas. In urban and sub-urban areas, data capacity issues may be able to be addressed at least to some extent [redacted]. In major towns and dense urban areas, [redacted]'
58. Vodafone submitted that [redacted].
59. Table 5 summarises what the operators have told us about their refarming plans. It shows that all are considering substantial refarming, bearing in mind the constraints imposed by the need to maintain a 3G network in the medium term.

³³ Ofcom, [Public Sector Spectrum Release \(PSSR\): Award of the 2.3 and 3.4 GHz bands \(7 November 2014\)](#), paragraphs 7.53 to 7.60.

Table 5: Spectrum used for 4G and planned or prospective refarming

<i>Refarming (to 4G) and rollout plans by operator</i>	<i>Amount and share of the operator's spectrum used for 4G</i>
Telefónica	
Spectrum currently deployed (on at least some sites)	2x10 MHz (23%)
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
H3G	
Spectrum currently deployed (on at least some sites)	[REDACTED]
2x5 MHz of 2.1 GHz in 2017	[REDACTED]
Further 2x5 MHz in 2018	[REDACTED]
Remaining 2x5 MHz in 2020+ potentially	[REDACTED]
Rollout of recently acquired spectrum (20 MHz of SDL)	[REDACTED]
Vodafone	
Spectrum currently deployed (on at least some sites)	2x30MHz (34%)
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]
EE	
Spectrum currently deployed (on at least some sites)	2x40 MHz (38%)
Planned roll-out of 2x5 MHz of 800 MHz to 4G to start by end of 2015	2x45 MHz (43%)
Planned rollout of remaining 2x15 MHz of 2.6 GHz	2x60 MHz (57%)
[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]

Source: Parties and third parties

Note: [REDACTED]

Other network investments

60. The parties submitted that they consider that none of the MNOs will be capacity constrained before the auction of 2.3 GHz and 3.4 GHz spectrum, but that aside from purchasing spectrum, operators have a range of options for increasing capacity, including refarming, cell sectorisation, building more macro sites or small cells, or making more use of spectrum that is licence-exempt or licensed for shared use. These options were also highlighted by Ofcom, which also noted that:
- (a) For cell sectoring, which adds capacity by subdividing the cell, there may be limits to the space available for the additional necessary antennas at the sites concerned, and the need to manage interference issues.
 - (b) Interference issues also apply to adding additional macro sites, where it also takes time to negotiate permission to use suitable sites. It may also be harder to find suitable new sites because more easily accessible (hence lower cost) sites may be acquired and built first.
 - (c) An alternative method is to deploy small cells in areas with larger capacity requirements within the macro-cell. As they are smaller, these cells can be deployed in a wider variety of locations than macro-sites.

61. Telefónica submitted that ‘although there are other ways of extending capacity in a network to a certain degree, deploying spectrum is the fastest and most economical way to roll out capacity and meet data demand’. Telefónica supported this with an example: [REDACTED]:

(a) The increase from three to six sectors increases site capacity by approximately [REDACTED], due to increased inter-sector interference; further, in many cases it is not feasible to deploy additional antennas due to planning or site restrictions’. Moreover, Telefónica considers that six sector upgrades are useful in the short term only, as:

- (i) they are incompatible with the use of future technologies; and
- (ii) if Telefónica acquired additional spectrum, six sector cells would need to be removed on smaller sites to make sufficient physical space available to deploy the additional spectrum.³⁴

(b) ‘Further site densification is not a substitute for more 4G capacity spectrum, [REDACTED]’.

(c) Telefónica is [REDACTED].

62. H3G submitted that:

(a) [REDACTED]

(b) [REDACTED] H3G also submitted that ‘the site rentals and business rates payable on new sites [REDACTED]’. H3G told us that Deloitte has recently estimated that the cost of an average site is [around £55,000 to £58,000 yearly], with site rentals and business rates representing 20%.³⁶ This is significantly higher than the rents and rates paid by other utilities, eg energy and water. Moreover, rents in congested areas, eg London, tend to be significantly more expensive than in non-congested areas.’

(c) its modelling shows that with its current spectrum holdings, if H3G were to deploy [REDACTED], this would have [REDACTED]. Moreover, there are material practical challenges involved in such deployment, including those of finding a sufficient number of suitable locations and dealing with practical deployment and coordination issues, such as spectral interference issues as a result of small cells re-using existing spectrum currently used in the macro layer (unlike deployments in Korea and Japan where dedicated spectrum carriers are used). [REDACTED]

³⁴ [Telefónica response to provisional findings](#), p5.

63. EE told us that the option of adding additional nearby macrocells was available in relation to all sites, subject to obtaining access to appropriate land/infrastructure, but that, ‘in very dense urban areas, the deployment of additional sites may require a substantial redesign and optimisation of sites in the local area. This is because deployment of additional sites in close proximity to existing sites could lead to interference and degradation to the quality of service provided by the existing sites’.
64. Notwithstanding this, Telefónica submitted that it was investing significantly in [REDACTED]. [REDACTED] Vodafone submitted that it expected to continue to pursue all the options for network investment as opportunities arose and to the extent that it was cost effective to do so. [REDACTED]
65. Table 6 summarises what the MNOs have told us about their planned network investments. [REDACTED]

Table 6: Planned network investments

	<i>EE (in network JV with H3G)</i>	<i>Telefónica (in network JV with Vodafone)</i>	<i>Vodafone (in network JV with Telefónica)</i>	<i>H3G (in network JV with EE)</i>
Number of existing or planned macro sites	[REDACTED]	[REDACTED]	[REDACTED] ^{¶¶}	[REDACTED]
Cell sectoring	[REDACTED] ^{‡‡}	[REDACTED]	[REDACTED]	[REDACTED]
Planned small cells	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
Other			[REDACTED] ^{§§}	

Source: Third party responses.

‡‡ Further sectorisation is prevented by restrictions on EE’s rights at other sites

§§ [REDACTED]

¶¶ [REDACTED]

New spectrum

66. The parties submitted that ‘one way MNOs can increase capacity on their networks (but by no means the only way) is by acquiring additional spectrum. As spectrum availability is expected to increase by [approximately 50% in around the next five years], there will be ample opportunity for any of the MNOs to obtain more, if required, in the short to medium term’.
67. In the medium term, a large amount of additional mobile spectrum will become usable in the 1.4 GHz³⁵ band, which has already been released, and in the 2.3 GHz and 3.4 GHz bands, for example.³⁶ Over the longer term:

³⁵ In June, Qualcomm put this spectrum up for sale. See The Register (June 2015), ‘[Qualcomm selling its 1.4GHz spectrum \(with a little help from Ofcom\)](#)’.

³⁶ Through the Public Sector Spectrum Release (PSSR) award, Ofcom plans to auction 40MHz of 2.3GHz spectrum and 150MHz of 3.4GHz spectrum. The Ministry of Defence has now released this spectrum to Ofcom. [Ofcom \(26 October 2015\), Public Sector Spectrum Release \(PSSR\) Statement](#).

- (a) Ofcom submitted that ‘other mobile spectrum will become available for mobile data services, such as in the 700 MHz band’;³⁷ and
- (b) the parties submitted that ‘It is expected that higher frequency spectrum will become relevant for future mobile technologies such as 5G. For example, on 16 January 2015, Ofcom issued a *Call for Inputs* on the use of spectrum above 6 GHz for future mobile communications’.
68. As each spectrum band is released, it may not necessarily be suitable to provide immediate substantial capacity to operators. As Telefónica submitted, the speed with which spectrum becomes useful is affected by:
- the maturity of the technology which supports that frequency. The speed at which use of a particular frequency penetrates the base also depends on the number of device models that support it (eg whether all models of devices support it, or only devices at the higher end) and the popularity of those devices. On average if a frequency is supported by Apple and Samsung devices (which are currently the most popular amongst UK consumers), it can reach approximately [X] of [Telefónica]’s [X] smartphone [X] at the end of the [X] year after introduction of the technology.
69. Telefónica submitted that the CMA should not take the 1.4 GHz, 2.3 GHz and 3.4 GHz bands into account in assessing spectrum holdings either at present or following the transaction. It argued that it would be appropriate for the CMA to take into consideration in its competition assessment the substitutability and availability of existing mobile bands ‘during the next two to four years (ie in the short-to-medium term)’ and that this approach is supported by the European Commission’s approach in its recent decisions on the Hutchison 3G UK/Telefónica Ireland and Telefónica Deutschland/E-Plus cases, ‘in which the Commission noted that it typically uses such a period to assess the effects of a proposed merger (and that a longer period would mean more speculative prediction of future market conditions)’.³⁸
70. Vodafone, in response to our provisional findings, submitted that the CMA had not properly considered the differences between spectrum in relation to its ability to provide 4G data traffic capacity now and in the future. In particular, Vodafone contrasted BT and EE’s existing holdings of unused spectrum with

³⁷ [Ofcom response to issues statement](#).

³⁸ See [Case No. COMP/M.6992, Hutchison 3G UK/Telefónica Ireland](#), decision of 28 May 2014, paragraph 765; and [Case No. COMP/M.7018 Telefónica Deutschland/E-Plus](#), decision of 2 July 2014, paragraph 940.

spectrum that had yet to be released and/or could not yet be used in most phones.³⁹

71. The theories of harm we are assessing involve potential effects on competition from the merger that would not arise for several years – that is, over time as BT potentially grew as a mobile retailer; and in future when the MVNO contracts of Sky, TalkTalk and Virgin become subject to new negotiations. For that reason, we consider it appropriate to consider MNOs' capacity in the medium to long term, including how it may be affected by the deployment of new spectrum.
72. While the 1.4 GHz spectrum has already been traded, and the 2.3 and 3.4 GHz spectrum is expected to be auctioned by Ofcom in the short term,⁴⁰ these bands will not all be immediately useful. However, as they come into use, they have the potential to reduce the extent of asymmetry in spectrum holdings across operators.
73. Table 7 shows the three new bands in order of when we have been told they will be useful, and shows how each operator's share of usable spectrum will change over time if they don't purchase any further spectrum. Note that Vodafone and H3G's share will increase when the 1.4 GHz spectrum they have purchased becomes usable, and that the 2.3 GHz and 3.4 GHz spectrum which has yet to be auctioned makes up 23% of what will be usable spectrum.

Table 7: Spectrum shares over time

	<i>EE</i>	<i>Telefónica</i>	<i>Vodafone</i>	<i>H3G</i>	<i>BT</i>	<i>BT/EE</i>	<i>Available for acquisition as % of usable</i>
All current spectrum	37	15	28	12	8	45	
Once 2.3 usable	35	14	26	11	7	42	7
Once 1.4 usable	32	13	27	14	7	39	6
Once 3.4 usable	25	10	21	11	5	30	23

Source: CMA analysis of spectrum holdings data provided by Ofcom

Note: the final column shows the 2.3 GHz and 3.4 GHz spectrum, which remains available for acquisition, as a % of usable spectrum, assuming that the 2.3 GHz spectrum becomes usable first, then the 1.4 GHz spectrum, and then the 3.4 GHz spectrum,

74. However, [redacted] argued that the availability of new spectrum is not sufficient to eliminate concerns, because:

³⁹ Vodafone [response to provisional findings](#).

⁴⁰ Ofcom [published its PSSR statement on 26 October](#).

- (a) it will not all be immediately usable, as the supporting devices and network⁴¹ ecosystem are not yet in place;
- (b) some other characteristics of the spectrum make it less attractive than existing 4G spectrum – in particular that the 1.4 GHz spectrum is usable for downlink only, while the 3.4 GHz spectrum has inferior propagation characteristics. [REDACTED]
- (c) there is a risk that the PSSR auction will be delayed – because it may be subject to legal challenges and delay; and
- (d) there is a risk that they will be unable to secure in the auction when it occurs the spectrum they consider necessary.

Usable dates

75. Telefónica submitted that support from the leading smartphones and devices is essential for capacity spectrum. It also stated that this depends on there being demand for this frequency across a range of consumer and product/service segments (this is important to drive economy of scale; there could be significant costs involved in asking suppliers of devices/technologies to support frequencies specifically for Telefónica). Telefónica supported this by noting that ‘it has taken more than two years for the 2.3 GHz band, first introduced in devices in 2012, to be accessible by [REDACTED] of devices; [Telefónica] believes this period would have been longer had the band not been supported by leading device manufacturers’.
76. H3G summarised its view on the likely timing of device take-up in Figure 5. This suggests that [REDACTED].

Figure 5: [REDACTED]

[REDACTED]

Source: [REDACTED]

77. Other respondents considered that the 2.3 GHz and 1.4 GHz spectrum, in particular, would be useful sooner than 2020. Table 8 summarises the submissions we have received on the date by which the different bands of spectrum may become useful.

⁴¹ For example, Telefónica noted that if a frequency is introduced with a new technology (eg 800MHz for 4G), then a whole system design is required, eg 4G network launch and network roll-out. This can take at least one year to design and launch.

Table 8: Submissions on the useful date of new spectrum bands

	2.3 GHz	1.4 GHz	3.4 GHz
The parties	Short term almost immediately after release	In the medium term (within 2 years)	In the medium term (within 2 years)
EE internal docs	[redacted]	[redacted]	[redacted]
Telefónica	[redacted]	[redacted]	[redacted]
Vodafone	[redacted]*	[redacted]	[redacted]†
H3G	[redacted]	[redacted]	[redacted]
HTC	[redacted]	[redacted]	[redacted]
Ofcom	already some devices in use in the UK including iPhone 6 and 6+; wide range globally	1-3 years	Uncertain, but consider 2-3 years likely‡

Source: Operators; Ofcom response to issues statement.

*[redacted]

†[redacted]

‡Ofcom submitted that 'We understand that multiband chipsets covering the main mobile bands listed above as well as 3.4 GHz will become available during 2015 from at least one of the major suppliers. It will take longer for the installed base of user devices that can use 3.4 GHz to build up.' Ofcom response to issues statement.

78. The evidence therefore suggests that the 2.3 GHz spectrum may become useful in a substantial proportion of devices (and therefore allow significant offload) by 2017; this is likely to be later for other bands, but before 2020.

Characteristics of the spectrum

TDD vs FDD spectrum

79. Vodafone highlighted that the 2.3 GHz and 3.4 GHz bands are TDD spectrum, in contrast to the vast majority of mobile spectrum in use in the UK, and that this means that there will be a delay before sufficient compatible handsets are available in the UK. However, H3G submitted that capacity constraints for paired spectrum are typically in the downlink channel, [redacted].

2.3 GHz spectrum

80. Telefónica submitted that 2.3 GHz is 'an effective and immediate capacity substitute to 2.6 GHz spectrum'. The parties submitted that 2.3 GHz has superior propagation characteristics to 2.6 GHz.

1.4 GHz spectrum

81. The parties submitted that the 1.4 GHz spectrum 'has the benefit of being lower frequency spectrum'; H3G submitted that because it is licensed for use as supplemental downlink (rather than for both up and downlink), and currently there are no handsets in the market, [redacted]. However, we note that

where capacity challenges exist they are generally in the downlink, and that this is relatively low frequency spectrum, which would tend to make it more valuable because of its better propagation characteristics (for in-building and rural coverage).

82. Telefónica submitted that, because this spectrum has been acquired by H3G and Vodafone, [REDACTED].

3.4 GHz spectrum

83. The parties submitted that ‘the 3.4 GHz band is well suited to deployment in the small cell ‘layer’ (although this spectrum has also been deployed on macrocells)’.
84. In particular, EE submitted an internal document on the 2.3/3.4 GHz auction that noted that [REDACTED].
85. Telefónica submitted that, even when device support for 3.4 GHz becomes available, it will never be a complete substitute for 2.6 GHz spectrum, and argued that this view is ‘supported by the fact that, in the forthcoming PSSR Auction, Ofcom is proposing a reserve price for the 2.3 GHz band (a new band with a mature ecosystem of devices) which is up to five times higher than that proposed for the 3.4 GHz band’. Telefónica submitted that the reasons for this are: (a) device availability (discussed above); (b) propagation characteristics; and (c) network compatibility.
86. In relation to propagation, Telefónica submitted that ‘given its higher frequency, the 3.4 GHz band has significantly worse propagation characteristics than other mobile bands’, and that this will prevent effective use on existing macrocell grids, particularly in urban areas where there is a higher density of buildings, which higher frequency bands are worse at penetrating. Telefónica submitted that ‘in practice [] we expect this spectrum to be used in a complementary way, providing capacity on small cells in dense urban areas where traffic density makes the deployment of small cells economic, or for other innovative purposes like small cell backhaul’.
87. Telefónica also submitted that it ‘envisages that FDD/TDD Carrier Aggregation will be available much later for the 3.4 GHz band than for other bands, further limiting the 3.4 GHz band’s substitutability. When this arrives, it will significantly improve end user speeds as well as helping to mitigate the coverage disadvantage of TDD’.

Ofcom's views on relevant spectrum

88. In its November 2014 consultation on the competition assessment for the 2.3 GHz and 3.4 GHz spectrum award, Ofcom proposed that, to avoid very highly asymmetric spectrum holdings, a cap of 37% of relevant spectrum should be put in place in the award.⁴² This would include all relevant mobile spectrum, including 1.4 GHz, 2.3 GHz and 3.4 GHz. Ofcom submitted to us that 'we did not propose that 3.4 GHz spectrum should be treated differently to 2.3 GHz or 1.4 GHz spectrum as in the longer term a reasonable number of devices would exist but we noted that there was some uncertainty over this'.⁴³

Possible auction delays

89. Telefónica submitted that the PSSR auction is unlikely to make new spectrum available in a timely manner because:

the PSSR Auction process and Auction rules may be subject to legal challenges and delay, as was seen in the case of the recent 4G auction (which was originally expected by Ofcom to take place in summer 2009 but was delayed until 2013 as a result of various legal challenges brought by the mobile operators in the UK).

90. Ofcom published its PSSR statement on 26 October 2015. In this statement, the auction was set to start in early 2016.⁴⁴ On 3 December 2015, however, Ofcom announced that it would not commence the auction process until the Commission has taken its decision as to whether the proposed merger between Telefónica UK Limited and Hutchison 3G UK Limited was compatible with the common market.⁴⁵ At present, the Commission has a deadline for its decision of 20 April 2016.⁴⁶ Ofcom told us that it aimed to proceed with the auction once the Commission's decision has been made.

Possible results of the PSSR auction

91. The parties submitted that, 'with significant amounts of new spectrum being auctioned in the near future, Ofcom has considerable scope to ensure that spectrum is allocated in a manner that will continue to underpin retail and wholesale competition' and that 'should the other MNOs wish to acquire more spectrum for their future needs, in particular for capacity, it will soon become

⁴² However, in its decision on the PSSR auction, Ofcom decided not to impose this cap. [Ofcom \(26 October 2015\), Public Sector Spectrum Release \(PSSR\)](#).

⁴³ [Ofcom response to issues statement](#).

⁴⁴ [Ofcom \(26 October 2015\), Public Sector Spectrum Release \(PSSR\) Statement](#).

⁴⁵ Ofcom, [communication](#) on 3 December 2015.

⁴⁶ [European Commission case M.7612 Hutchinson 3 G/Telefonica UK](#).

available. In the context of this additional spectrum, the volume of spectrum BT will add to EE's holding is relatively small'.

92. Vodafone submitted that future availability of spectrum to any individual operator is uncertain. Telefónica also argued that there is no certainty as to which operators will win spectrum in the most useful 2.3 GHz band – of which there is only 40 MHz – and that the merged entity will have increased incentives for strategic bidding so as to prevent other operators doing so.
93. Ofcom submitted that it considers it unlikely that operators will make strategic investment in spectrum to weaken rivals, because:

If all other factors were equal, we would expect operators with a low share of spectrum currently to have a higher intrinsic value for spectrum than rivals with a high share of spectrum currently. This is because those with a low spectrum share are likely to obtain the greatest network cost savings from obtaining more spectrum (because they will need to add to capacity more in order to meet forecast demand). Given BT/EE large holdings of spectrum, we would expect them to tend to have lower intrinsic value of additional spectrum than rivals. This tends to increase the cost of strategic investment.

There will be a large amount (190 MHz) of spectrum in the award. A bidder trying to prevent others obtaining any spectrum would need to acquire all of this spectrum, which would tend to push up the price.

The pay-off from the strategic investment may be unclear, as this may depend on technical and market conditions that are difficult to predict. For example, it may be unclear to BT/EE how successful any strategic investment may be in frustrating rivals, given that rivals could have effective commercial responses to not obtaining spectrum.

There is no obvious 'focal point' for the division of spectrum in the auction between the operators with large spectrum shares currently.⁴⁷

94. In its subsequent statement on the auction, Ofcom also stated the following:

⁴⁷ [Ofcom response](#) to issues statement; see also paragraph 7.102 of [Ofcom's November 2014 consultation on the 2.3/3.4 GHz award](#).

Additionally, we believe the likelihood of a single bidder outbidding all the other bidders in the auction, or acquiring a very large volume of spectrum, is lower as a result of decisions set out in our May 2015 statement. These included the choice of a simultaneous multiple-round ascending auction (SMRA) as the format for our award.

In our SMRA design, the price for lots within each band will be the same – or very similar. In order to outbid all the other bidders, or to acquire a very large amount of the spectrum, a bidder would need to keep on bidding on a large amount of the lots available. This in turn would have the effect of increasing the price for all the spectrum in that band available in the auction. Such a strategy could however fail, and the bidder might end up winning a smaller amount of the spectrum at a high price – potentially a price that exceeds the bidder’s valuation for that smaller amount of spectrum.⁴⁸

95. In relation to other forms of strategic bidding behaviour (such as aiming to push up the price paid by rivals), Ofcom submitted that ‘our auction design considers the risk of strategic bidding in a number of ways. For instance, we have decided to limit the amount of information available to bidders during the auction’.⁴⁹
96. We asked Ofcom its view of whether and how competition could be affected over time if operators with lower holdings of spectrum do not win all, or any, of the 2.3 GHz spectrum in the auction. Ofcom submitted that:

In our November 2014 consultation on the competition assessment for the 2.3 GHz and 3.4 GHz spectrum award we proposed that to avoid very highly asymmetric spectrum holdings a cap of 37% of relevant spectrum should be put in place in the award. This would include all relevant mobile spectrum (including 1.4 GHz). We did not propose that 3.4 GHz spectrum should be treated differently to 2.3 GHz or 1.4 GHz spectrum as in the longer term a reasonable number of devices would exist but we noted that there was some uncertainty over this.

⁴⁸ Ofcom (26 October 2015), [Public Sector Spectrum Release \(PSSR\) Statement](#).

⁴⁹ [Ofcom response to issues statement](#).

97. Ofcom has subsequently published its statement on the PSSR award, in which it concluded that strategic bidding concerns were not significant enough and that it was not necessary to impose any form of spectrum holding cap.⁵⁰

Speed and congestion

The effects of speeds on competition

98. The MNOs submitted evidence that data demand is increasing. For example, Telefónica reported that there is an increasing trend of consumers migrating to larger data tariffs and signing up to higher data allowance.
99. We received a range of arguments and evidence suggesting that customers care, at least to an extent, about the speed of data services on their mobile devices.
100. We received some submissions highlighting increasing demand for 4G, which provides higher speeds than 3G:
- (a) Telefónica believes that UK customers see 4G representing faster speed as one element considered holistically in the choice of network, also associated with better reliability, higher data bundles and generally a more advanced technology.
 - (b) Research conducted for Vodafone on the key drivers of choice for various types of mobile customers showed that [REDACTED].
101. We heard some submissions that emphasised the value of speed:
- (a) H3G reported that data consumption increases as speed increases – for example, H3G saw a [REDACTED] in data consumption in a cohort of contract voice customers as a result of their adoption of 4G.
 - (b) Two pieces of research conducted by Ofcom in 2012 (ie before the 4G roll-out) showed that:
 - (i) 73% of the consumers surveyed would be willing to pay a premium for improved mobile coverage and more data capacity.
 - (ii) 58% of consumers would be willing to pay £5 per month more for better speed/capacity.

⁵⁰ Ofcom (26 October 2015), [Public Sector Spectrum Release \(PSSR\) Statement](#).

- (c) H3G submitted that the transition that consumers are making in fixed broadband, from standard to superfast, indicates that [✂].
- (d) Vodafone and H3G submitted that EE's marketing of its mobile offering demonstrates EE's view of the importance of perceived network quality (including speed and capacity) in customers' choice of retail mobile provider. Vodafone highlighted EE's campaign advertising its 4GEE service, which offers a higher 4G speed, and the higher premium consumers are willing to pay to have access to this service. H3G also highlighted speed claims that Vodafone uses in its marketing.
- (e) Vodafone submitted that RootMetrics, which conducts regular Mobile Network Performance Reviews, considers speed as important in assessing customer satisfaction.⁵¹
- (f) H3G emphasised that EE and Vodafone are investing heavily in high speeds, noting that EE's CEO has said in relation to its recent trial of 400 Mbit/s speeds at Wembley stadium that 'there are applications, particularly when we move to 4K TV content for both consumer and business, where there will be a real requirement for these types of speed in the long run'.⁵² H3G also submitted that the download speeds provided in the advanced markets of Sweden (more than 10 Mbit/s) and Korea (around 15 Mbit/s or more)⁵³ are an indicator of the speeds that UK consumers will require in future.

102. Some information we received suggested that high speeds are less important than other aspects of service. For example, An Ipsos MORI report prepared for Ofcom in December 2014 noted that aspects of services related to voice (reception and quality) are more important in determining consumers' satisfaction than mobile internet speed and reliability.⁵⁴

103. Figure 6 shows the results of a survey by YouGov, included in Ofcom's Communications Market Review 2015. In this survey 10% of respondents said the speed of internet connectivity was the most important factor when deciding to take up a 4G plan. Price was the most important factor overall, being ranked 1 by 44% of respondents.

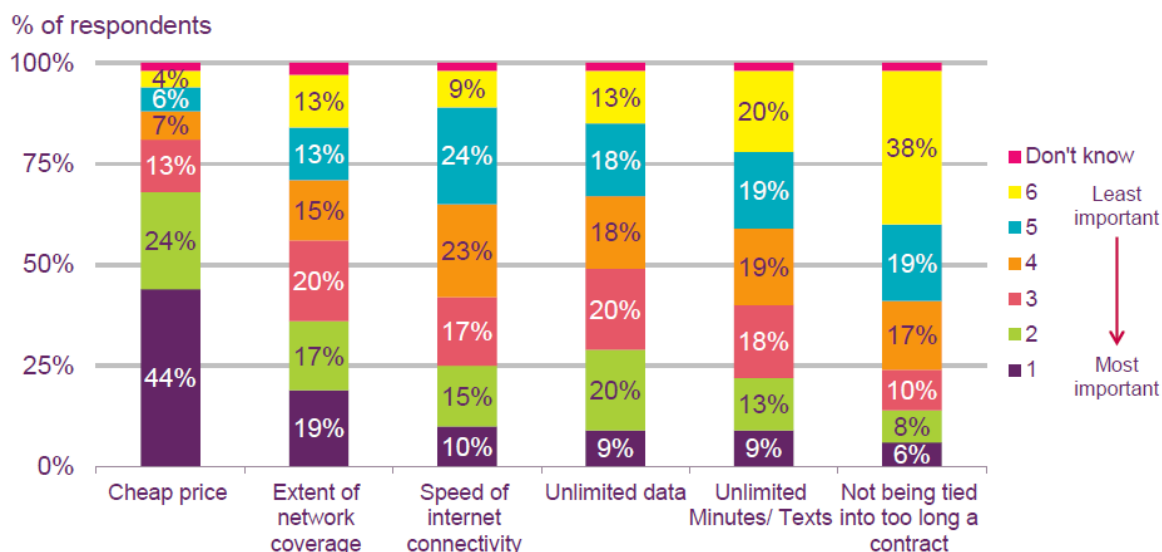
⁵¹ [RootMetrics website](#).

⁵² Mobile World Live (2015), '[EE boss claims BT merger will spur 5G](#)'.

⁵³ H3G submitted data from Open Signal.

⁵⁴ Ipsos MORI (December 2014), [Mobile coverage research](#).

Figure 6: Importance of factors when deciding to take up a 4G plan

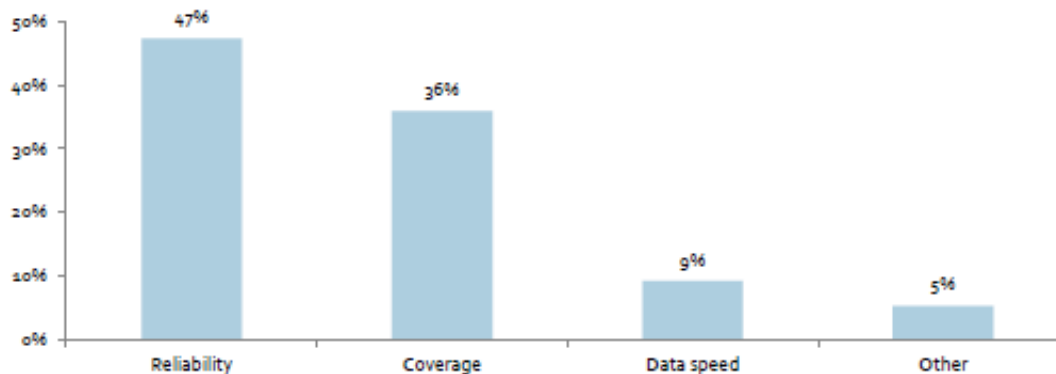


Source: YouGov, 4G tariffs 22-28 May 2015

Note: Base was online adults 16+ who do not currently have 4G (388) Q40. Which of these would be most important when deciding which 4G plan to take up? Please put in rank order of 1-6 where 1= most important and 6 = least important.

104. [REDACTED] EE also provided evidence from an Enders Analysis consumer survey from May 2014 which showed that when assessing network quality, data speed was the most important factor for only 9% of customers (Figure 7).

Figure 7: Most important factor for quality of a mobile network for respondents



Source: EE.

105. Consumers' perceptions of 'reliability' (which 47% of respondents considered most important) and 'coverage' (which 36% of respondents considered most important) may be in part driven by experiencing occasions when data speeds are too low to be usable. However, this may suggest that high data speeds are not strong drivers of competition.

106. In support of the view that low data speeds are important for competition, data submitted by H3G showed that [REDACTED].

107. H3G submitted that MNOs competed both on minimum *and* average speeds, saying that 'separate and apart from issues arising from mobile network

congestions, average download speeds across the network are an increasingly important competitive element in their own right'. H3G also submitted that it expected that network quality and capacity/average data speeds would be increasingly important in consumer's choice of provider, as these were key components in consumers' perception of network quality. It said that future data growth was expected to come from entertainment applications such as high definition video and media streaming, which required high data rates and reliable connectivity. Video streaming already represented more than [X] % of H3G's data traffic. H3G submitted that Cisco expected video to generate more than 70% of total UK mobile traffic by 2018, and that MNOs would require sufficient capacity for consumers to be able to stream video at an acceptable data rate. H3G submitted that average and peak speeds were also likely to increase in importance with the widespread deployment of small cells. This was because small cells typically served fewer users closer to the base station, and so consumers were more likely to enjoy data rates that were closer to peak data rates.

108. It is not clear what precise levels of speed are relevant and important for competition, and how customers' valuation of speed varies as it increases. RootMetrics has commented that 'while 4G speeds are often eye-catching, keep in mind that a law of diminishing returns exists with speed: you need enough speed to perform typical consumer activities with ease, but beyond that the benefits of extra speed might not be impactful'.⁵⁵ Below we consider the speeds currently achieved, and indicators of what speeds may be important for customers.

Current speeds and related measures

109. Average speeds at present are likely to be affected by spectrum through:
- (a) the extent of congestion – ie the number of sites and duration of time over which speeds are low because demand is high relative to the overall amount of spectrum deployed; and
 - (b) speeds achieved at uncongested sites – which are more strongly driven by spectrum bandwidth (including carrier aggregation) than total spectrum (although the two are related).
110. We understand that at present average speeds are more strongly affected by the latter than the former. Table 9 shows the maximum spectrum bandwidth that operators can achieve, with and without refarming, and carrier

⁵⁵ RootMetrics (May 2015), *4G in the UK: Fast Speeds and Expanding Footprints*.

aggregation. At present, only two-carrier aggregation is in active use in the UK (using specific bands), but the use of aggregation involving further bands and three and four carriers is expected over time.

111. Vodafone submitted that 2x80 MHz bandwidth (as available to EE with sufficient carrier aggregation) could [REDACTED],⁵⁶ [REDACTED].⁵⁷ H3G submitted that prior to refarming the merged entity could carrier aggregate 2x60 MHz and 1x20 MHz [REDACTED].

Table 9: Operators' maximum spectrum bandwidth for 4G, with and without refarming

Refarming	EE*		Vodafone		Telefónica		H3G	
	No	Yes	No	Yes	No	Yes	No	Yes
No aggregation	2x20 MHz (1.8 GHz)	2x20 MHz (1.8 GHz)	2x10 MHz (800 MHz)	†	2x10 MHz (800 MHz)	2x10 MHz (800 MHz)	[REDACTED]	[REDACTED]
2 carriers	2x40 MHz (1.8 GHz, 2.6 GHz)	2x40 MHz (1.8 GHz, 2.6 GHz)	2x30 MHz (800 MHz, 2.6 GHz)	†	not possible	[REDACTED]: 2x15 MHz [REDACTED]: 2x20 MHz	[REDACTED]	[REDACTED]
3 carriers	2x55 MHz (1.8 GHz, 2.6 GHz)	2x60 MHz (1.8 GHz, 2.6 GHz)	[REDACTED]‡	†	not possible	2x25 MHz	[REDACTED]	[REDACTED]
4 carriers	2x60 MHz (800 MHz, 1.8 GHz, 2.6 GHz)	2x80 MHz (1.8 GHz, 2.1 GHz, 2.6 GHz)	[REDACTED]	†	not possible	2x30 MHz	[REDACTED]	[REDACTED]

Source: MNOs

*EE submitted that this represents a purely theoretical view of what may be possible in terms of the maximum spectrum that could be used for 4G (with refarming). It does not take into account the practicalities, for example, using the 3GPP standardised carrier aggregation bands, nor does it show the practical order that the spectrum would be used in, in reality.

†Vodafone submitted that refarmed bands would allow additional carriers to be deployed for 4G, over and above those which could be deployed in the 'no refarming' column. Consequently, it is not meaningful to contrast bandwidths for a given number of carriers between the two columns.

‡[REDACTED]

112. This table shows that at present [REDACTED]. We note that operators may be able to increase their carrier bandwidth by purchasing spectrum at the upcoming PSSR auction and/or when subsequent spectrum such as that in the 700 MHz band becomes available.

113. H3G submitted the following data on average download speeds over time (see Figure 8), which shows that EE's average speeds are [REDACTED].

Figure 8: [REDACTED]

[REDACTED]

⁵⁶ If BT/EE were to deploy all its combined 4G-ready spectrum, it would have a total of 2 x 80 MHz of 4G-ready spectrum (with a further increase possible from refarming more of the 1,800 MHz spectrum). Given that 2 x 40 MHz using carrier aggregation provides 'quad speed 4G', 2 x 80 MHz would therefore provide 'eight speed 4G'.

⁵⁷ However, Vodafone also added that while this is true in theory, compared to the merged entity's spectrum constrained competitors, the merged entity would either have little incentive to do so, or only do so at significantly higher prices compared to pre-merger.

Source: [38]

114. Table 10 presents data collected by Ofcom on the speeds experienced on each operator's network between March and June 2014. It confirms that, at that time, EE's network achieved the fastest 4G download and upload speeds. However, all four operators provided average 4G download speeds of 10 Mbit/s or more. This is supported by separate monitoring by RootMetrics, which finds that all operators currently offer median 4G speeds of around 10 Mbit/s or more in most cities.⁵⁸

Table 10: Indicators of speeds on the MNOs' networks

	EE	Telefónica	Vodafone	H3G
				<i>Mbit/s</i>
Average HTTP 4G download speed	18.4	15.6	14.3	10.7
Average HTTP 3G download speed	6.8	5.6	6.7	5.2
Average 4G upload speed	14.7	13	11.4	11.1
Average 3G upload speed	1.6	1.6	1.5	1.7
				<i>s</i>
Average time to load standard webpage on 4G (s) (low is better)	0.76	0.82	0.82	0.62
Average time to load standard web page on 3G (low is better)	1.05	1.17	1.06	0.93
				<i>milliseconds</i>
Latency on 4G	48.2	62.7	59.8	47.6
Latency on 3G	64.3	86.4	64.7	53.8

Source: Ofcom (November 2014), [Measuring mobile broadband performance in the UK: 4G and 3G network performance](#).
Note: Fieldwork for this project was undertaken from March 2014 to June 2014.

115. It is also worth noting that although H3G provides lower speeds compared to others, its time to load a webpage and 3G and 4G latencies⁵⁹ are the lowest among the four MNOs, meaning that consumers potentially get a better experience. We also note that H3G has been rated as having a more reliable network than its rivals,⁶⁰ a factor seen as more important than speed in some of the surveys described earlier, and used by H3G in its marketing.⁶¹

116. Moreover, we are interested in the speeds that operators can offer their customers only insofar as they are important for competition, and although higher spectrum bandwidth can facilitate higher peak and average speeds, it is not clear how much consumers value such speed increases.

117. We noted earlier that the incidence of slow speeds may be particularly important for competition (as distinct from average speeds as shown above, or the highest speeds possible, as driven by carrier aggregation). Below, we

⁵⁸ www.rootmetrics.com.

⁵⁹ The responsiveness of the network, measured by recording the time it takes for a small piece of data to travel to one point and return a response to the user's device.

⁶⁰ Three.co.uk - Discover Awards.

⁶¹ Three.co.uk.

consider the evidence we received on how slow speeds may be defined.

Minimum speeds and congestion measures

118. We asked the MNOs about how they measure the speeds and capacity on their network, and what thresholds they consider important. All operators use both information collected directly from their networks, and data that is gathered from a customer perspective, using crowdsourced data or 'drive trials' that use devices connected to monitoring equipment within trial vehicles. We understand that network statistics are highly correlated with data gathered from the customer perspective.
119. Each of the MNOs track a wide range of indicators to assess the performance of their networks, and have different target thresholds for these metrics. In relation to minimum speeds, [REDACTED]:
- (a) [REDACTED]
- (b) [REDACTED]⁶² [REDACTED]⁶³ H3G submitted that there is an increasing requirement to support higher speed data services such as video streaming.
- (c) [REDACTED]
120. EE targets an [REDACTED]. EE told the CMA that services are not anticipated that require significantly higher speeds than existing video or gaming uses.⁶⁴
121. Vodafone has a range of targets for average speeds and for the incidence of low speeds, [REDACTED]. Vodafone's 4G network [REDACTED]. Vodafone submitted that the increase in mobile data per customer will naturally raise customer expectations of acceptable quality and current operator network minimum speed thresholds will have to raise significantly to meet such expectations.
122. [REDACTED]⁶⁵ [REDACTED]⁶⁶ [REDACTED]
123. The MNOs therefore use a range of speed targets, and those relating to minimum speeds at peak hours are substantially lower than those which relate to average or usual speeds.
124. We now consider operators' ability to meet these speed thresholds, taking into account both projected increases in data demand, which will tend to reduce

⁶² Ofcom, *Measuring mobile broadband performance in the UK: 4G and 3G network performance*, figure 9.

⁶³ *ibid*, p2.

⁶⁴ [EE hearing summary](#).

⁶⁵ This can be described as 'spectral efficiency'.

⁶⁶ Although it expects these maximum to increase over time as more advanced network features become available.

speeds, and planned network investments which will tend to increase speeds.

Congestion on Vodafone's network

125. We asked Vodafone to provide us with forecasts of the proportion of its sites that may become congested over time. This showed that [REDACTED].
126. We therefore do not further consider capacity constraints in respect of Vodafone.

Assessments of H3G and Telefónica capacity constraints in other operators' internal documents

127. [REDACTED]:
- (a) [REDACTED]
 - (b) [REDACTED]
 - (c) [REDACTED]
 - (d) [REDACTED]⁶⁷ [REDACTED]
128. EE submitted an internal document on the 2.3/3.4 GHz auction that noted that the 1.4 GHz band could [REDACTED]. [REDACTED] In the same document, EE also noted [REDACTED].
129. There are also a number of references in BT's internal documents to MNOs potentially becoming capacity constrained in the longer term. One states that the rise in use of mobiles and demand for data will drive MNOs to increase capacity, [REDACTED].
130. BT emphasised to us that it has also within its internal documents considered how the MNOs can increase their capacity on their networks not just by using additional spectrum, but also through technological upgrades and network build strategies. It highlighted documents that consider auctions for 2.3 GHz and 3.4 GHz spectrum, refarming existing 3G spectrum to 4G, as well as, time division LTE and the use of small cells. Based on these developments, BT forecasts that the MNOs can be expected to deliver a [REDACTED] capacity increase by 2020.
131. [REDACTED]

⁶⁷ The auction is now expected in 2016. See [Ofcom \(26 October 2015\), Public Sector Spectrum Release \(PSSR\) Statement](#).

Congestion on H3G's network

Submissions from the parties

132. As noted above, the parties do not consider it plausible that any of the MNOs could face significant capacity constraints. In relation to H3G, they submitted the following:

[H3G] confirmed plans to focus strongly on network deployment over the rest of the year. Most significantly, it will switch on its 800 MHz spectrum later in 2015. This will be the first time [H3G] has deployed low-frequency airwaves, and customers should quickly benefit from better rural and indoor coverage. The move will also pave the way for the introduction of voice services over LTE.

It is incumbent upon the CMA to require H3G to present clear evidence that it is unable to meet demand on a sustained basis before any such representations can be taken into account. The Parties consider it highly unlikely that any such evidence would be available, taking into account the various options to add capacity at H3G's disposal (and also noting H3G's recent acquisition of 1.4 GHz spectrum from Qualcomm) and H3G's recent conduct in bidding for and winning MVNO contracts, including Carphone Warehouse.

Submissions from H3G

133. H3G submitted that '12 years after its market entry, [H3G] remains [redacted] relative to its competitors. [H3G]'s ability to acquire new customers and grow its market share is very limited. Our network carries 45% of all data traffic in the UK on just 12% of the spectrum. [H3G] is [redacted].'
134. H3G also submitted that, contrary to what the merging parties had argued, [redacted].⁶⁸
135. H3G supported this with information on the extent of current congestion on its network, and expected congestion over time.
136. Table 11 shows the level of congestion (as of April 2015) on H3G's 3G network – [redacted] of sites are congested and [redacted]% are in danger of becoming so in the short to medium term (if a [redacted] threshold is used to determine 3G congestion). [redacted], as shown in Figure 9. Figure 9 also shows that H3G's [redacted].

⁶⁸ [H3G response to provisional findings](#), paragraphs 5 & 6.

Table 11: Congestion on H3G's 3G network in April 2015

	<i>Number of sites</i>	<i>Red</i>	<i>Amber</i>	<i>Green</i>
3 carrier sites	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
2 carrier sites	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
1 carrier sites	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
Total	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
Percentage of sites	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]

Source: H3G

Note: [REDACTED]

Figure 9: Congestion on H3G's 3G network over time

[REDACTED]

Source: [REDACTED]

137. [REDACTED]

138. H3G supported this with:

- (a) Evidence showing that, in [REDACTED]; and
- (b) Evidence showing that, [REDACTED].

139. H3G has recently purchased 20 MHz of 1,400 MHz spectrum. An internal document provided by H3G showed that before this purchase, H3G forecasted that [REDACTED].

140. H3G, however, told us that [REDACTED]. H3G also submitted that:

- (a) [REDACTED]
- (b) [REDACTED]⁶⁹
- (c) [REDACTED]⁷⁰

141. We note that following the purchase of the 1.4 GHz spectrum, H3G now holds a higher proportion of mobile spectrum than its market share of subscribers.

142. Further spectrum, in the 2.3 GHz and 3.4 GHz bands, will be auctioned by Ofcom soon.

143. In its response to our provisional findings, H3G submitted that [REDACTED], saying that H3G's rivals have a multiple of revenues and operating profits to H3G, as well as significantly larger scale which allows them to monetise the investment across many more consumers. H3G also said that there is an incentive for its

⁶⁹ [REDACTED]

⁷⁰ [H3G response to provisional findings](#), paragraphs 17–21.

rivals to bid strategically to exclude H3G in spectrum auctions.⁷¹

144. Our view is that, should spectrum be important for H3G's competitiveness this will tend to increase the intrinsic value of that spectrum to H3G, and hence boost its willingness to pay and likelihood of winning spectrum. As discussed at paragraph 90 onwards of this appendix, and in Chapter 12 of the main report, Ofcom considers it unlikely that operators will make strategic investments in spectrum to weaken rivals; we also note that aspects of the auction are designed to make such bidding more costly.
145. An internal document provided by H3G showed that it had previously considered that [REDACTED].
146. H3G provided us with more recent congestion forecasts, taking into account the deployment of some 3.4 GHz spectrum (but no 2.3 GHz) spectrum. [REDACTED]
147. [REDACTED]:
 - (a) [REDACTED]
 - (b) [REDACTED] In the scenario where H3G refarms 2.1 GHz and also deploys 1.4 GHz and 20 MHz of 3.4 GHz, using a 1 Mbit/s threshold congestion reaches around [REDACTED]% of sites by [REDACTED], or around [REDACTED]% with a 2 Mbit/s threshold.
 - (c) [REDACTED]
 - (d) [REDACTED]
148. We note, however, that:
 - (a) While individual users may require [REDACTED], it is not clear that it is necessary for the *average* throughput at a busy site during peak hours to provide such speeds, given the range of different data services that may be accessed by individual users. We think this is particularly true in the short to medium term [REDACTED].
 - (b) H3G' forecasts involve the purchase of [REDACTED] spectrum (of which [REDACTED] is available). They do not include any possible purchase of 2.3 GHz spectrum which is becoming available soon, or of 700 MHz spectrum which is also due to become available: in November 2014, Ofcom set out plans to release the 700 MHz band for mobile broadband. The objective is

⁷¹ H3G [response to provisional findings](#), paragraph 8.

to make this happen by the start of 2022, and possibly up to two years sooner. Ofcom is also exploring the possibility of releasing the 700 MHz band for mobile use on a region-by-region basis as it becomes available.⁷²

(c) [REDACTED] as through spectrum purchase, although we note H3G's submissions on the limited efficacy of such investments.

(d) Moreover, H3G's bid [REDACTED] suggests that it anticipated that it would have sufficient capacity to host [REDACTED]; its reasons for [REDACTED] related to a number of factors including (but not limited to) [REDACTED]. Since then, H3G has purchased 20 MHz of 1.4 GHz spectrum.

149. Moreover, H3G currently has the [REDACTED] data use per customer, [REDACTED].

Congestion on Telefónica's network

Submissions from the parties

150. In addition to highlighting the range of options available to potentially capacity constrained operators, the parties argued in relation to Telefónica specifically that its behaviour in the wholesale market suggests that it will not face substantial capacity constraints – it has recently entered into full MVNO arrangements with Sky and TalkTalk.⁷³

Submissions from Telefónica

151. [REDACTED]

152. [REDACTED]

153. Telefónica submitted that [REDACTED]. At present Telefónica's customers use [REDACTED].

154. Telefónica submitted that '[REDACTED] will be an important factor in assessing whether or not to bid for MVNOs'. Moreover, Telefónica submitted that its recent decision to take on contracts with Sky and TalkTalk does not imply that it does not expect capacity constraints. Telefónica submitted that, as providers of fixed-mobile bundled services, these MVNOs would, if bundled offerings become popular, be likely to take disproportionate numbers of customers from Telefónica, which does not have a bundled offer. Therefore,

⁷² The [award of the 2.3 GHz and 3.4 GHz spectrum bands Information Memorandum](#), Ofcom, 26 October 2015.

⁷³ O2, 2 October 2015, [Lycamobile signs new multi-year MVNO deal with O2](#).

Telefónica submitted that its approach to the MVNO market is not inconsistent with the capacity challenges it faces. [REDACTED].⁷⁴

155. [REDACTED]:

[REDACTED]

156. However, as noted earlier, median data use is [REDACTED], with EE estimating that [REDACTED] of users consumed less than [REDACTED]GB per month.⁷⁵ Moreover, as shown in Table 12, Telefónica’s current contracts do not appear to be substantially less generous for high data users than those offered by other operators.

Table 12: Contracts with data allowance of 5 GB or more

<i>Data allowance</i>	<i>Operator</i>	<i>Offers</i>
5GB	BT	£25 (£20 for BT broadband customers), 12 month contract, UL
	O2	£28, 1 month, UL texts + calls
	Giffgaff	3G: £15, 500 UK minutes, UL texts, Free to GG 4G: £18, 1,000 UK minutes, UL texts, Free to GG
6GB	EE	UL text+ calls £26.99, 1 month, £22.99 12 months
	Vodafone	UL text + calls £29, 1 month; £27 12 months
7GB	O2	£28, 12 months, UL texts+ calls
8GB	H3G	£19-£27 depending on contract duration and mins and text allowance
10GB	EE	UL text+ calls, £31.99, 1 month; £28.99 12 months
	O2	£32, 12 months, UL texts + calls
Unlimited	Giffgaff (3G only)	£20, 2,000 UK minutes, UL texts, Free to GG
	H3G	£17-£30 depending on contract duration and mins and text allowance

Source: Operator websites, data gathered August 2015.

157. Telefónica considers that it [REDACTED]. Figure 10, below, is adapted from a 2015 Telefónica internal document.⁷⁶ Telefónica submitted that it shows [REDACTED].

158. [REDACTED]

Figure 10: [REDACTED]

[REDACTED]

Source: [REDACTED]

159. Telefónica submitted, however, [REDACTED].

⁷⁴ Telefónica response to provisional findings, p2.

⁷⁵ Calculated on the basis that there are 83.4 million subscribers, and EE estimates that the 42 millionth subscriber falls in the interval [REDACTED] per month. This is a conservative estimate; [REDACTED].

⁷⁶ Telefónica considered its approach to the recent sale by Qualcomm of spectrum in the 1.4 GHz band, and noted that its valuation of the spectrum was depressed by the expectation of the proposed purchase of Telefónica by H3G. The sale has now completed and Telefónica did not win any of the spectrum. We have therefore removed from the table those scenarios which rely on Telefónica winning 1.4 GHz spectrum.

160. Telefónica also submitted evidence that used an alternative measure, comparing ‘network capacity’, measured in Gbit/s, with forecast demand. [REDACTED].⁷⁷ [REDACTED]
161. We consider that the above evidence suggests that, [REDACTED]:
- (a) [REDACTED];
 - (b) [REDACTED]; and
 - (c) [REDACTED]
162. We also note that:
- (a) Telefónica has [REDACTED].⁷⁸
 - (b) Telefónica has chosen to host Sky and TalkTalk, [REDACTED].
 - (c) 700 MHz spectrum will also become available by the beginning of 2022, and possibly up to two years sooner.⁷⁹

⁷⁷ [Telefónica response to provisional findings](#), pp4–7.

⁷⁸ [REDACTED]; see also, for example: [Nokia \(2014\), *Deployment Strategies for Heterogeneous Networks*](#): ‘Furthermore, the 3.5 GHz spectrum also has great potential for urban macro cells deployment [..]The signal to interference and noise ratio characteristics at 2.6 GHz and 3.5 GHz are very similar’.

⁷⁹ Ofcom (26 October 2015), [The award of 2.3 GHz and 3.4 GHz spectrum bands Information Memorandum](#).

Fixed-mobile bundles

1. This appendix sets out the evidence we have received on the following:
 - Uptake of fixed-mobile bundles in other countries.
 - Survey evidence on consumer interest in fixed-mobile bundles.
 - Forecast uptake of fixed-mobile bundles in the UK.
 - Supply-side reasons for fixed-mobile bundling.
 - Demand-side reasons for fixed-mobile bundling.
2. By 'fixed-mobile bundles' we mean fixed (voice, broadband or TV) and mobile services purchased from the same provider, regardless of whether they are under the same contract, purchased at the same time, or sold with connected discounts.¹
3. The uptake of fixed-mobile bundles in the UK has been quite limited to date, and is significantly less than in some other European countries, notably Spain and France. We have seen a range of evidence from industry participants, and internal reports submitted by the parties and others, which suggest that the demand for fixed-mobile bundles is expected to grow. Some evidence suggests that the rate of growth will be rapid. It appears that one key (supply-side) driver for this is fixed operators wishing to reduce the rate of churn amongst their fixed customers, and attracting mobile customers through discounts in order to achieve this. Mobile and fixed operators appear also to be developing bundles as a defensive strategy against the possibility that their customers are attracted away by bundles offered by other operators. Other (demand-side) benefits to consumers, such as combined billing or future converged products may also play a role. The parties submitted, however, that there is no consensus that demand for fixed-mobile bundles will grow rapidly in the near future. To an extent, this is reflected in the documents we have seen from other operators² – this appears to be an area of significant market uncertainty.

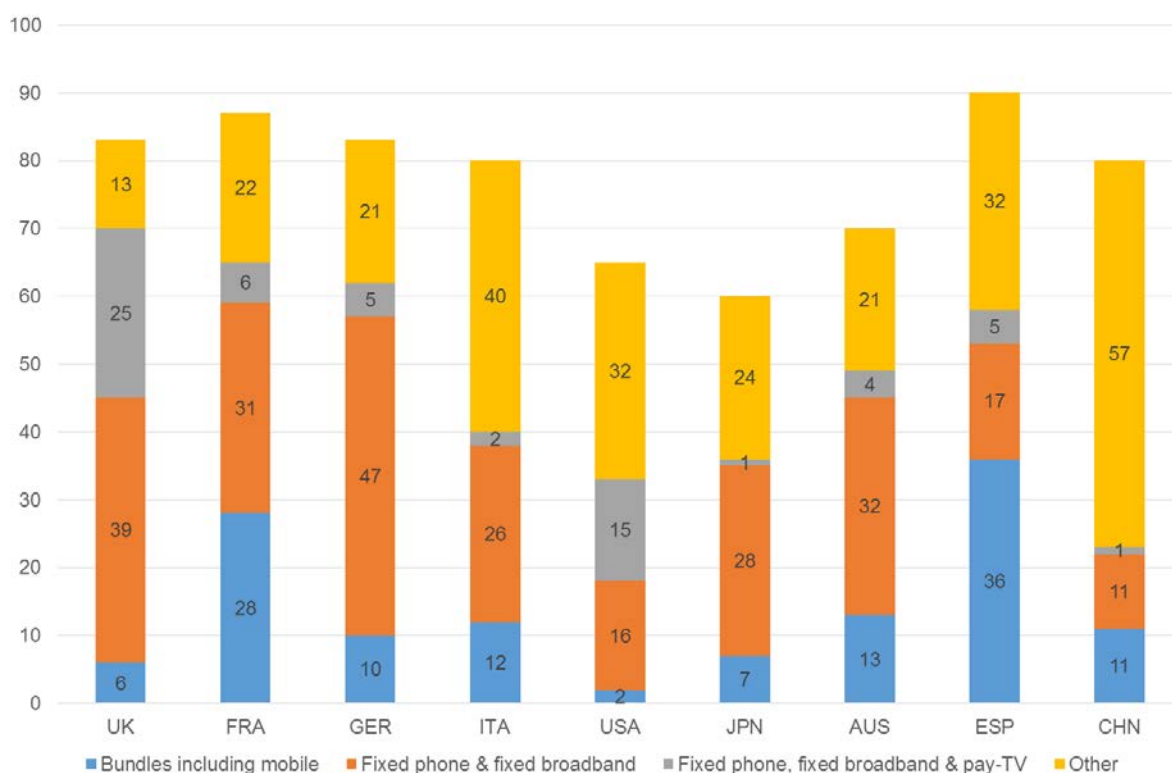
¹ Although we note that the parties submitted that there is an important distinction between 'cross-selling' services (provided under separate contracts) and 'bundling' (involving a single contract).

² See paragraphs 14 & 24–26.

Uptake of fixed-mobile bundles in other countries

4. Figure 1 summarises data from Ofcom’s International Communications Market Report³ which described the take-up of bundles across nine comparator countries. In the UK, more than 80% of respondents purchase two or more communications services as part of a bundle – similar to or higher than in the comparator countries. However, purchases of fixed-mobile bundles are less common in the UK (at 6% of respondents) than in the other European countries included – particularly France (28%) and Spain (36%) – although higher than in the USA (2%).

Figure 1: Bundling across nine comparator countries



Source: [Ofcom consumer research October 2014](#).

Notes:

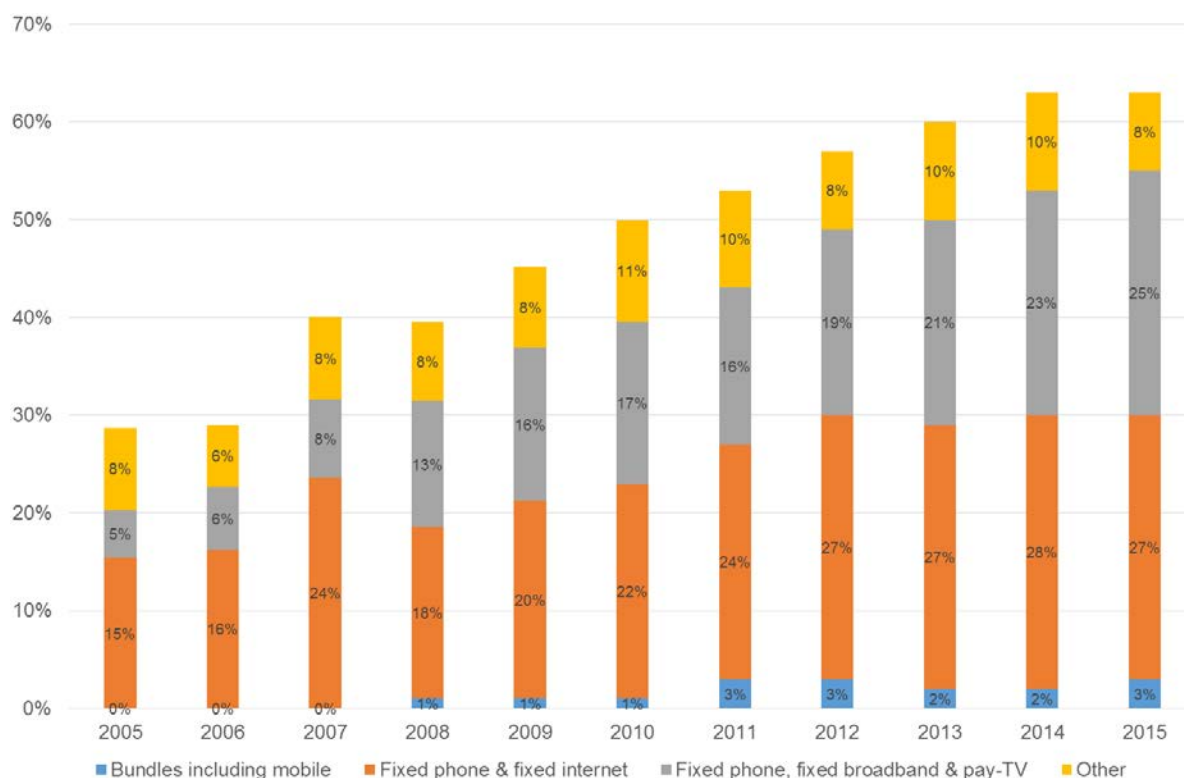
1. Base: All respondents with more than one service, UK=956, FRA=945, GER=941, ITA=931, USA=845, JAP=798, AUS=914, ESP=947, CHN=854.

2. Q.5 Do you receive a package or bundle of two or more of these services from the same supplier?

³ See Ofcom (2014), [International Communications Market Report](#), pp33–34.

5. The parties highlighted that among those buying fixed and mobile products, from the same provider, few are doing so as part of a single contract.⁴ This is reflected in Figure 2, which reports the results from a more recent Ofcom survey (with a larger sample)⁵ that asked consumers whether they purchase multiple services as part of an overall deal or package, and shows that current take-up of such deals is 3%. Use of this type of fixed-mobile bundles has remained roughly stable over the past five years.⁶

Figure 2: Bundling ‘as part of an overall deal or package’ (2005 to 2015)



Source: Ofcom Technology Tracker. Data from Q1 (as reported in the 2015 [Communications Market Report](#)).

Notes:

1. Base: All adults aged 16+ (2015 n=3756).

2. QG1. Do you receive more than one of these services as part of an overall deal or package from the same supplier?

6. Growth of fixed-mobile take-up in France and Spain has been rapid, and assessments of this process were included in a number of third party and internal documents provided to us by the parties and third parties. For example, see the following:

(a) EE notes that for [REDACTED]; and that [REDACTED].

(b) In a presentation prepared for Sky, it is noted that in Spain and France ‘the success of quad-play offers has been driven by a number of factors,

⁴ [BT/EE response to issues statement](#), paragraphs 3.18–3.24.

⁵ The consumer research for the International Communications Market Report was conducted online with 9,065 consumers in nine countries: UK, France, Germany, Italy, USA, Japan, Australia, Spain and China. This allowed [REDACTED].

⁶ See [Ofcom \(2015\), Communications Market Report](#), pp34–35.

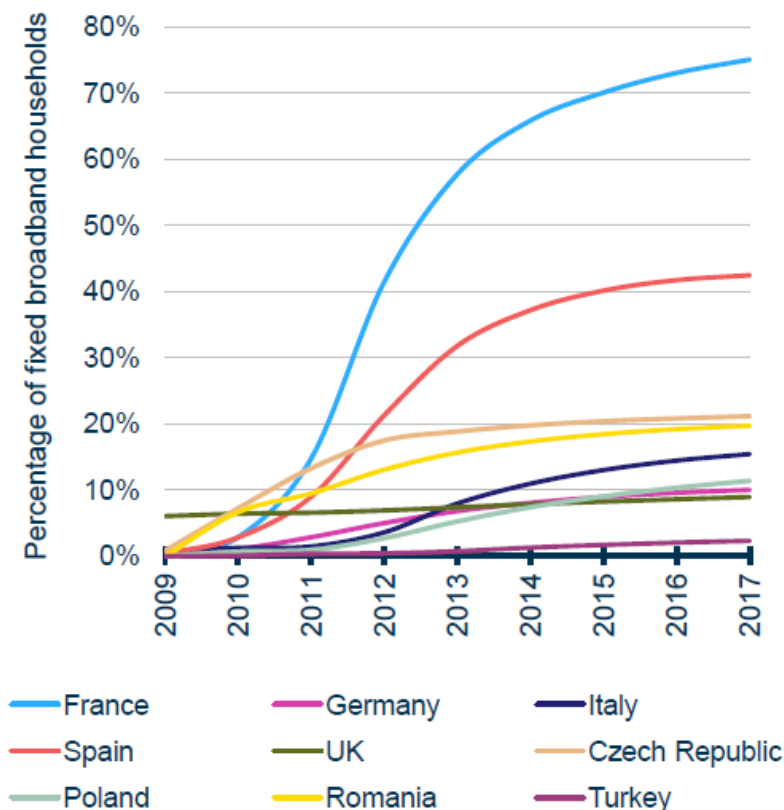
including highly integrated players, highly differentiated propositions and pricing, high customer satisfaction, success in selling mobile into existing fixed/ triple play customer base and operators in poor financial shape’.

- (c) Analysys Mason reports that the particularly high take-up of fixed-mobile bundles in France and Spain is the result of:
 - (i) high mobile service prices which allowed fixed operators to offer significant discounts for mobile services, making fixed-mobile bundles quite appealing; and
 - (ii) the presence of strong converged operators that were able to respond to aggressive competition by new entrants.

(d) [✂]

7. Figure 3, from a report by Analysys Mason, shows that by 2013 take-up had grown rapidly in some countries, and that further growth was expected in some countries – but more slowly in the UK than in most other countries considered.

Figure 3: Penetration of bundles that include mobile voice, European countries, 2009 to 2017



Source: Analysys Mason report on behalf of BT (2013), *Multi-play services in Europe: forecast and analysis 2012-2017*.

8. [✂]

9. Within those countries where a high proportion of consumers buy fixed-mobile bundles, some fixed operators have achieved even higher proportions of fixed-mobile take-up among their broadband customers, as shown in Figure 4, which is taken from a 2015 internal document of BT's, with the caption: [REDACTED].

Figure 4: [REDACTED]

[REDACTED]

Source: [REDACTED]

10. From other parties' documents and submissions, it is clear that competitors are also interested in the success of fixed and mobile bundles in other countries and how it could be translated into the UK market:
- (a) EE notes that the aggressive pricing strategy used by Free in France has been used more recently by TalkTalk offering free SIMs for broadband customers. Moreover, EE observes that [REDACTED].
 - (b) In a presentation prepared for [REDACTED].
 - (c) Sky submitted to the CMA that the 'experience in other European countries (such as Spain) shows that a determined incumbent supplier, which is also a major MNO, can push a market towards bundled offers at dramatic speed'.⁷
 - (d) Vodafone states that [REDACTED].⁸
 - (e) A document prepared by The Boston Consulting Group for BT in September 2014 noted the 'accelerating trend towards quad play in Europe', and that fixed-mobile convergence has had 'different impacts in different European markets'. It argues that in the UK there are 'several players with strong motivation to bundle'. [REDACTED]⁹
 - (f) In a survey prepared for Virgin Media, it is noted that [REDACTED].¹⁰
11. From the evidence set out above, it appears that discounting has been a significant driver of the take-up of fixed-mobile bundling in France and Spain. The opportunities for such discounting in the UK are discussed later in this appendix.

⁷ [Sky response to statement of issues](#), paragraph 2.12.

⁸ [REDACTED]

⁹ [REDACTED]

¹⁰ [REDACTED]

Fixed-mobile bundles in the UK

12. Table 1 shows the main operators present in each of the segments which could be provided in a fixed-mobile bundle, along with their shares of supply. It shows that fixed-mobile bundling is currently modest, but that several operators are planning launches soon which will allow them to offer both fixed and mobile services to consumers and businesses.

Table 1: Share of supply in fixed-mobile bundles and constituent products

					%
	<i>Fixed voice*</i>	<i>Broadband†</i>	<i>Mobile‡</i>	<i>TV subs</i>	<i>Share of fixed-mobile</i>
BT	[X]	31	[X]	[X]	[X]
EE	[X]	3	29	[X]	[X]
Virgin	[X]	20	4	[X]	[X]
Sky	[X]	20	Plans 2016	[X]	Plans 2016
TalkTalk	[X]	15	[X]	[X]	[X]
Vodafone	Consumer	Consumer	19	Plans 2015	Plans 2015
	Plans 2015	Plans 2015			
O2	Business only	[X]	26	-	Business only
H3G	No plans	No plans	10	No plans	No plans
Post Office	[X]	[X]	Launched 2015	n/a	Launched 2015
Market\segmen t size (subs)	33m	23.7m	[X]	[X]	[X]

Source: [Ofcom and parties' submissions](#) (see notes).

*Ofcom data and Ofcom (August 2014), [The communications market report](#) – with the exception of EE's figure.

†Ofcom (August 2014), [The communications market report](#) – with the exception of Post Office and Telefónica's figures.

‡Ofcom (March 2015) [Mobile Call Termination report](#).

#Approximation.

~Since November 2014.

13. Table 2 shows data on the share of each operator's consumer mobile customers that buy fixed products from them, and vice versa.

Table 2: Proportion of each operator's household customer base currently purchasing fixed and mobile services as a bundle

<i>Operator</i>	<i>Proportion</i>
Virgin Media	In February 2015, [X]% of customers who bought mobile services also subscribed to cable services (dual, triple or quad-play). In March 2015, [X]% of cable customers have at least one mobile.
TalkTalk	TalkTalk mobile products are only available to TalkTalk fixed line customers. In March 2015, TalkTalk calculated that [X]% of its retail broadband customers also bought TalkTalk mobile services.
BT	BT forecasts suggest that in 2015, [X]% of its mobile services will be sold to broadband customers. BT forecasts suggest that in 2015, [X]% of its fixed services will be sold to mobile customers.
EE	[X] Subscription to EE's broadband product does not require the subscriber to be (or become) a subscriber to EE's mobile services. However, EE TV is available only to existing subscribers to both of EE's broadband and mobile services

Source: Various.

14. Parties and third parties provided the following information about their offers, on the nature of the links between fixed and mobile services:

- (a) BT co-sells fixed and mobile services to business customers. BT submitted that 'to a limited extent, BT also offers some forms of mixed

fixed-mobile bundles to business customers,¹¹ [redacted]. For consumers, BT offers a £5 per month discount on its mobile services for its broadband customers. It also offers its mobile customers access to BT Wi-Fi and to the BT Sports app, whether or not the customer buys BT's fixed TV service.

- (b) EE offers fixed and mobile services to residential and business customers. Fixed telephony and broadband services are offered to residential and business customers as a bundle. EE offers a 'data boost' to mobile customers that buy its broadband service, and provides an option to share the bigger allowance with whole household.
- (c) TalkTalk offers mobile services to both residential and business customers bundled with fixed and broadband services. For consumers, it currently offers its mobile service only to broadband customers, and certain mobile packages are free.
- (d) Virgin Media sells mobile services to residential, private and public sector business customers. Consumers can add a mobile SIM to any fixed bundle for £5 per month.
- (e) Telefónica sells integrated fixed and mobile services to businesses only. Telefónica is able to offer combined fixed and mobile products to business customers at a lower price than separately, on a customer-by-customer basis or through quarterly offers that are limited in scope and for a limited period of time.
- (f) Vodafone offers integrated offers of fixed and mobile services to business customers and has launched consumer fixed services this year. The launch pricing for its consumer broadband service 'Vodafone Connect' involves a £5 discount on broadband for Vodafone mobile customers.

(g) [redacted]¹²

15. As discussed above, fixed-mobile bundles are already available from a number of players in the market. The parties emphasised however, that some of the fixed-mobile propositions offered so far have not been particularly successful, and that this illustrates how challenging it is to interest customers in a fixed-mobile proposition. For example, they submitted the following:

¹¹ The term also encompasses all types of bundling or tying: (i) fixed services only being sold in combination with mobile services or vice versa ("pure bundling") or (ii) fixed and mobile services being sold at less than the sum of their component prices or with additional benefits such as data boosts or additional SIM cards ("mixed bundling")

¹² [redacted]

- (a) BT's earlier propositions, which offered converged fixed and mobile technology (BT Total Broadband Anywhere and BT Fusion) were commercially unsuccessful.
- (b) Telefónica has chosen to exit consumer broadband and sold its customer base to Sky in 2013.
- (c) 'EE has been trying to sell fixed-mobile propositions for many years and has sought advice from its shareholder, Orange, who has first-hand experience of the French market. With nine years' focus, including many years of offering free and significantly discounted broadband, EE has never achieved more than [redacted] share of the fixed broadband market, selling to its mobile base. EE has only [redacted] customers taking fixed and mobile services from it (which represents [redacted]% of the EE mobile subscriber base)'.
- (d) 'Virgin has offered fixed-mobile propositions for many years and take up has not exceeded [redacted]% of its subscriber base'.¹³ [redacted]
- (e) TalkTalk [redacted].

16. EE submitted that [redacted].

17. Moreover, the parties told the CMA that fixed and mobile services are typically cross sold on the basis of separate contracts. They submitted that customers are, therefore, easily able to unpick the bundle.

Forecasts of future uptake of fixed-mobile bundles in the UK

18. The parties and third parties submitted forecast data showing that uptake of fixed-mobile bundles is expected to rise, although these forecasts for the next few years vary and the predicted growth is from a low starting base:¹⁴

- In 2013, Analysys Mason noted historical growth from around 6% of households in 2009 to around 7.5% in 2013, and predicted similar growth over time, to reach just under 10% by 2017.
- In 2014, Ovum predicted that between 2012 and 2019, the estimated number of UK households subscribing to a quad-play bundle (ie a fixed-

¹³ Virgin Media [redacted].

¹⁴ BT submitted that 'these (and any other) predictions by analysts of future customer demand are, by their nature, highly speculative. BT would also caution the CMA against drawing firm conclusions from various reports which by their nature will include data from a variety of sources, some of which will be less robust (eg survey data with very small sample sizes).

mobile bundle including all three fixed services) is predicted to increase by approximately 37%.

- In 2015, [redacted] predicted [redacted] times the number of quad-play subscribers in the UK in 2019 compared to 2014.

19. Given their existing market shares in one of the constituent parts (as shown earlier in Table 1), both BT (via fixed) and EE (via mobile) may, in the counterfactual, have arguably been in a good position to gain a significant share of fixed-mobile customers, although we noted above their limited success so far. If the merger goes ahead, the merged entity will have both fixed and mobile infrastructure and large shares in each market. Virgin, Sky and TalkTalk also have strong shares in fixed (using their own infrastructure and regulated inputs), and have existing or planned mobile products, albeit based on wholesale agreements. Vodafone has a strong mobile share (and its own network) and fixed plans (using its own network alongside regulated inputs).
20. We asked each operator about the number of customers it expects to sell both fixed and mobile products to. Their forecasts are presented in Table 3, and are consistent with very substantial growth in the number of fixed-mobile customers over the next few years.

Table 3: Provider level forecasts of customers buying fixed and mobile services from the same supplier – absent the merger

	'000							%	
	Subscribers			Implied shares of supply		Proportion of mobile customers buying fixed (including TV and/or broadband services)		Proportion of fixed customers buying mobile (including TV and/or broadband services)	
	2015	FY 2016	FY 2019	2015	FY 2019	2015	FY 2019	2015	FY 2019
BT	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
EE	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	n/a	[redacted]	n/a	[redacted]

Source: Various (see notes).

*Data for 2015 relates to June 2015.

§[redacted]

~Sky provided estimates on the number of customers taking mobile and TV services from Sky and vice versa. This may include broadband services or not. We note that these numbers may underestimate the number of fixed mobile customers Sky will have by 2019.

Notes:

1. No data available for calculating the shares of mobile customers buying fixed for EE, TalkTalk and Vodafone for FY 2019.
2. No data available for calculating the shares of fixed customers buying mobile for EE and Vodafone for FY 2019.
3. n/p = not provided.

21. The parties submitted that they consider that these forecasts are highly likely to be significantly overstated.

22. The merger will lead to additional customers purchasing fixed and mobile services from the same supplier, by virtue of bringing together large suppliers of each product, and because additional customers may be persuaded to do so through additional opportunities for cross-selling or bundling:
- (a) BT's estimates of synergies from the merger include around [redacted] additional such customers in 2019, resulting from cross-selling facilitated by the merger.¹⁵
- (b) We estimate that among BT broadband customers, the number taking mobile services from EE (regardless of the merger) would be [redacted] million in 2015, and [redacted] million in 2019.¹⁶
23. The parties argued that BT and EE's own forecasts for fixed-mobile cross-selling in the future (with or without the merger) are relatively modest and consistent with the trend in the UK market to date.
24. Taking the merger effects into account, Table 4 combines the operators' forecasts to show what they imply for the overall proportion of households and mobile subscribers that may purchase fixed and mobile services from the same operator. These forecast imply take up, by 2019, which is greater than in France or Spain currently. Although this would represent a substantial proportion of households, expressed as proportion of mobile subscribers it would remain modest.

Table 4: Forecast purchases of fixed and mobile from the same subscriber – proportion of households and mobile subscribers

	'000	%	
		households	subscribers
<i>Customers buying fixed and mobile from the same supplier</i>		<i>Implied proportion of</i>	
		[redacted]	[redacted]
Absent the merger 2015	[redacted]	[redacted]	[redacted]
Absent the merger 2019	[redacted]	[redacted]	[redacted]
Plus synergies	[redacted]	[redacted]	[redacted]
Plus BT/EE overlap	[redacted]	[redacted]	[redacted]

Source: CMA analysis of operators' forecasts.

Consumer customers

25. Although the parties submitted that expectations about the growth of fixed-mobile bundles remain uncertain, operators submitted a range of comments,

¹⁵ [redacted]

¹⁶ [redacted]

internal documents and external reports which suggest that growth is anticipated, such as the following:

- (a) Virgin submitted documents that noted extensive customer interest in quad-play,¹⁷ with the most appealing benefits being the savings and convenience. Another document stated that: [REDACTED].
- (b) Virgin Media also submitted a number of surveys conducted on the behalf of Virgin Media and by external analysts that show a strong interest in consumer demand for bundling including quad-play offers. For example, one noted that: [REDACTED] bundles.
- (c) In a document from 2014, Telefónica reported that ‘analyst opinion is increasingly that convergence is likely to accelerate in the UK market [REDACTED]. It is also stated that ‘Although consumer appetite for quad services in the UK appears low, evidence from other markets suggests strong discounting drives take-up’.
- (d) Telefónica submitted other comments and internal documents that argue the following:

There is an escalating momentum behind convergence in the UK and it has the potential to significantly change the dynamics of how consumers purchase telecoms products.

‘Our market is moving towards some quad-play options’; ‘BT appears to have signed a deal with EE and is keen on a consumer offering’; ‘Mobile is coming – BT now sees mobile and convergence as “inevitable”’; and ‘Virgin has a new wholesale deal with EE and offers unlimited 3G (no public plans for 4G consumer but 4G business launched)’.

As a standalone consumer mobile player we will be exposed if convergence happens: Reduced addressable market; Accelerated ARPU decline from converged players discounting mobile.

We are facing into a real and imminent threat from the introduction of converged services in the UK. [...] [REDACTED]

¹⁷ [REDACTED], 24 June 2014.

(e) In a document prepared in November 2014, EE mentions cross-selling as a strategic priority in 2015.¹⁸ EE also submitted internal documents that stated the following:¹⁹ [REDACTED].

(f) Vodafone noted the following:

Bundled offers present an opportunity with the full breadth of consumers in each market – [REDACTED], the converged services market is ready to grow.

(g) Three submitted that BT has publicly stated that it sees a growing appetite for converged products in the UK as ‘the lines between fixed and mobile are blurring as people increasingly rely on tablets and smartphones to access data services’. It also submitted an external report that noted the following: [REDACTED].²⁰

(h) TalkTalk submitted that ‘the consumer market is moving to quad-play, by which I mean phone, broadband, TV and mobile being bundled together. That’s a combination of technology driving economic benefits, which in turn is creating some consumer benefits, not just in pricing but also in the quality and nature of the service from bundling those products together’.²¹ TalkTalk also submitted a document summarising survey work they had undertaken, which noted the following:

Most UK households are now bundling services, with more than a third currently on triple play’; ‘Alongside cost savings the convenience of having a single supplier and bill are considered key motivating reasons for bundling’; ‘Significant potential for mobile bundling, with three in five interested in taking mobile from ISP/LL supplier.

(i) In a presentation prepared for Sky, it is noted that ‘Selling fixed into a mobile base has proved challenging for operators; fixed operators have had more success in mobile but typically only when discounting heavily’. It is also noted that ‘Dual play bundles are currently the most popular among consumers; however triple play and quad-play bundles are forecasted to grow significantly in the next five years’.

(j) Sky also submitted that

¹⁸ [REDACTED]

¹⁹ [REDACTED]

²⁰ [REDACTED]

²¹ [TalkTalk hearing summary](#).

Whilst quad-play has not yet gained significant traction there is considerable scope for it to do so and for the UK to move in the direction of other European countries [...] [✂]

Industry operators and commentators expect UK customers increasingly to source fixed and mobile products from a single supplier. [...] BT's CEO Gavin Patterson emphasised that BT expects 'significant demand for fixed and mobile converged products' and stated that 'we will be better equipped than anyone else to offer those when the mobile is combined with fixed.

[✂]

26. BT submitted several internal documents that suggest that BT expects significant growth in sales of fixed-mobile bundles would be quite significant. [✂]
27. Finally, the parties emphasised that not all providers appear to consider that offering bundled propositions is necessary to meet consumer demands.²² For example, H3G during its hearing with the CMA explained that the best opportunity over the next few years for it to achieve success would be to focus on mobile but it remained open-minded to another path to follow in future.²³

Business customers

28. We also asked operators about the role of fixed services in sales of mobile to businesses. Overall, operators considered that in the business segment there is a growing trend for fixed-mobile bundling, cross-selling, and/or technically converged offers. Their responses varied in how different businesses were categorised, but are summarised below.
29. BT submitted that [✂]. In relation to technically converged offers, BT noted that demand is growing, particularly for mid-market and larger businesses.²⁴
30. Vodafone submitted that [✂].
31. TalkTalk submitted that all customer types within the business mobile market would be interested in fixed-mobile bundles, and that this is supported by research evidence.

²² The parties also submitted that even if all other providers did consider it necessary to offer bundled propositions, they would be able to do so using inputs that are available on competitive or regulated terms.

²³ [H3G hearing summary](#), paragraph 26.

²⁴ [✂]

32. EE submitted that the [✂].
33. EE's internal documents suggest [✂].
34. Telefónica submitted that 'business customers like the convenience of having a single supplier for fixed and mobile communications, especially if there is also a price advantage', and that 'providers who own both fixed and mobile networks may have a cost advantage over providers who do not, through their ability to cross-sell an additional service to their existing base.' Telefónica emphasised that 'for larger customers, fixed services represent a much greater share of their total communications spend than mobile,' implying that cross-selling from fixed to mobile may be more effective in that segment. Telefónica also submitted that 'increasingly, the lines between fixed and mobile-led telcos are blurring due to customer demand for consolidation and the emergence of technology such as Unified Communications that promises to bring mobile and fixed together and enable them to work together. The dynamic towards consuming converged services means that operators that are able to successfully deliver a single experience across mobile and fixed are best placed to perform successfully as demand continues to evolve'.
35. Telefónica provided supporting data from research into business attitudes towards consolidation and convergence conducted by GfK, submitting that this 'shows that larger organisations are [...] more likely to push for supplier consolidation and converged services across fixed & mobile connectivity. [✂]²⁵
36. It therefore appears that fixed-mobile bundles and/or converged fixed-mobile services are likely to be important for a growing proportion of businesses.

Supply-side reasons for fixed-mobile bundling

37. Ofcom has previously noted that fixed-mobile bundles can deliver benefits for consumers, for example where the retailing efficiencies associated with bundling can allow operators to deliver lower prices.²⁶
38. In its SRDC, Ofcom reported that 'the continued trend of convergence is driving new business models, new network architectures and merger activity. Adoption of bundled services continues to grow. It is likely that fixed and mobile technologies and networks will converge over time.'²⁷

²⁵ Small office/home office.

²⁶ See [Ofcom response to issues statement](#) paragraph 4.33; and Ofcom (July 2015), [Strategic Review of Digital Communications: Discussion document](#), paragraph 4.76.

²⁷ Ofcom (March 2015), [Strategic Review of Digital Communications: Terms of reference](#), paragraph 1.32.

39. We asked operators whether there are cost savings for them associated with providing fixed and mobile products together. They submitted that:
- fixed-mobile bundling may reduce customer churn in fixed services, which in turn reduces costs;
 - in future there may be some marginal benefits in terms of customer billing and/or support costs, but these are likely to be small;²⁸ and
 - there may also be infrastructure synergies in future.
40. These factors were also highlighted in analyst reports submitted by the parties and third parties.²⁹

Churn

41. Some operators told us that the more products customers buy together in a bundle, the less likely they are to switch provider, and that this pattern extends to the inclusion of mobile within the bundle.
42. This benefit is also described in analyst reports that we received, although some risks from bundling were also been noted:

Quad-play offers are key to operators to improve their life time value of customers and hence reducing churn [...] For the operator, the benefits of bundling include lower churn[,] increased customer lifetime value[, and] the slowing down of fixed voice line losses.

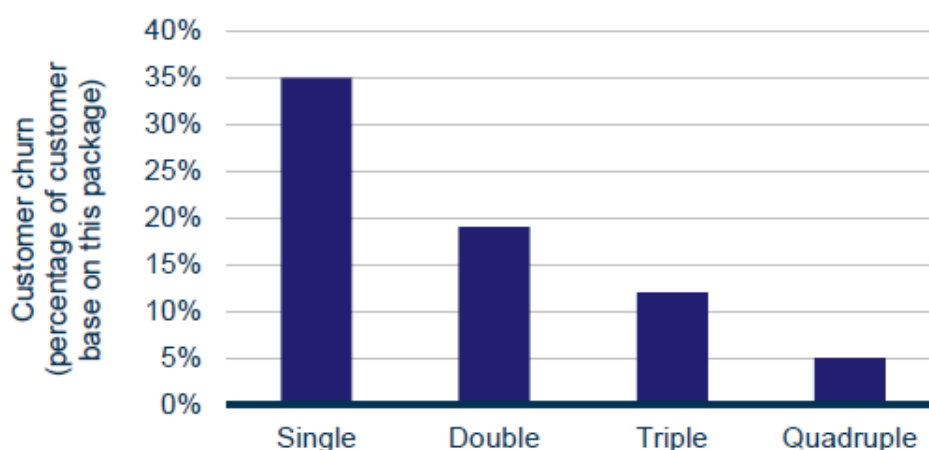
'Inflexible fixed-mobile bundles can increase churn rates'; 'Limited mobile tariff or handset options can lead to subscribers making compromise choices that later lead to churn'.

43. The relationship between bundling and churn is shown, for Virgin Media, in Figure 5.

²⁸ [REDACTED]

²⁹ For example, [REDACTED].

Figure 5: Annual churn rate for Virgin media customers, by bundle, 2011



Source: Analysys Mason report on behalf of BT (February 2013), *Multi-play services in Europe: forecasts and analysis 2012-2017*.

44. Virgin Media told us that it clearly sees benefits, in terms of lower churn; where a customer buys fixed and mobile together.
45. Telefónica submitted that ‘Virgin’s 2010 annual report noted that “triple-play customers are more profitable than double-play or single-play customers”. Acquisition costs are higher but revenue and lower churn is positive. Churn of Virgin Media’s quad-play customers is below 8% per annum’.
46. In the hearing, Telefónica also added that offering new products to existing customers (as BT did with BT TV) reduces customer acquisition costs in terms of lower churn by offering something that makes them stay.
47. TalkTalk submitted that cross-selling mobile contracts to its fixed customers leads to a reduction in churn of [X]%, potentially providing it with a strong incentive to roll out mobile to its customer base. It is not clear the extent to which this pattern is driven by customers with lower churn being more likely to purchase larger bundles, rather than vice versa. However, there is some support for the view that bundling reduces churn, in the fact that the pattern for reduced churn has remained as the number of customers purchasing double or triple play has increased over time.
48. Vodafone submitted an analysis of the effect of bundling on churn in Spain, France, Belgium, Switzerland and Netherlands that indicates that [X].
49. Sky told us that its existing churn rate is [X].
50. The parties noted that both fixed and mobile operators are seeking opportunities to cross-sell mobile services to their existing customers, and that [X]. However, BT also submitted that it has not forecast in its business plans

any churn benefit specifically as a result of cross-selling fixed and mobile services, [REDACTED].

51. The parties submitted that it is not correct to argue that bundling strongly reduces churn. Although an internal document submitted by EE states that [REDACTED].³⁰
52. BT submitted that ‘BT would expect that customers who take more than one service are likely to be positive about BT as a brand. However, the mere fact that a customer takes more than one service does not make them substantially less likely to switch any of the component services that they purchase if they are offered a better deal. [REDACTED]
53. BT also noted that if there were significant churn benefits, then the proportion of Virgin's customer base taking fixed-mobile propositions would be expected to increase over time, and this has not been the case.

Other synergies

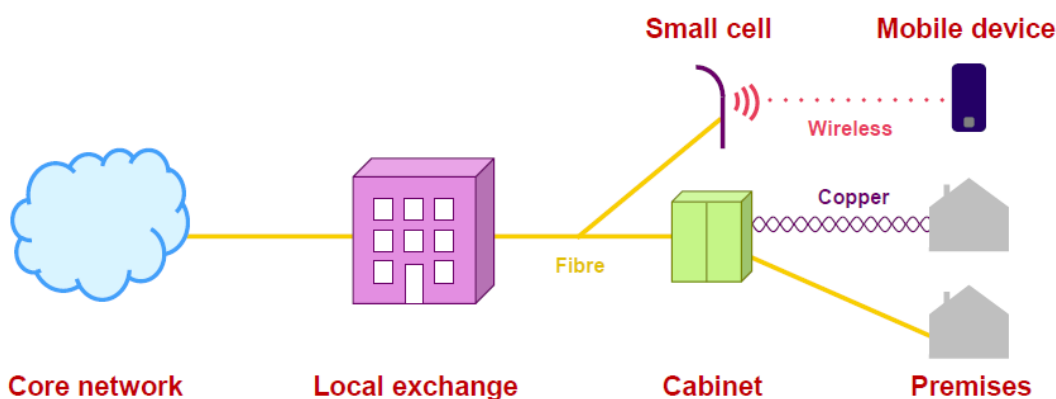
54. As noted above, some operators submitted that other cost savings associated with fixed-mobile bundles are likely to be small.
55. In relation to the business mobile segment, Telefónica emphasised that ‘providers who own both fixed and mobile networks may have a cost advantage over providers who do not, through their ability to cross-sell an additional service to their existing base’.
56. [REDACTED]
57. EE submitted an internal document where it stated that [REDACTED].
58. Sky submitted that [REDACTED]. This suggests that [REDACTED], there may be stronger cost synergies between fixed and mobile.³¹
59. In its SRDC discussion document, Ofcom noted that fixed and mobile networks have been historically operated using relatively separate infrastructure. However, Ofcom observes that there have been changes in the structure of both networks, which means that they are increasingly adopting common characteristics and even have the potential to use shared assets. Figure 6 shows the convergence of fixed and mobile networks where mobile networks are increasingly using fixed fibre leased lines to meet growing

³⁰ [REDACTED]

³¹ Sky also submitted that the extent of these synergies will depend greatly on access and the terms of access to fixed and mobile infrastructure. See Chapter 16 for discussion on this issue.

capacity demands and fixed networks are also increasingly connected to wireless devices, for example through consumers installing wireless routers in their premises.³²

Figure 6: Convergence of fixed and mobile networks



Source: Ofcom SRDC (2015).

Discounting

60. As set out earlier, discounting has been an important driver of fixed-mobile take-up in other countries.

61. [✂]³³

62. [✂]

Figure 7: [✂]

[✂]

Source: [✂].

63. Table 5 shows data from 2013 comparing the price of bundles in France, Spain and the UK, with the combined price of individual products from the same operators. Ender Analysis notes that ‘in the UK, where the mobile market is not afflicted with dramatic price deflation, and bundling discounts are modest (and often artificial, with standalone prices uncompetitive), fixed-mobile bundling and quad-play has been a much weaker market factor’.

³² Ofcom SRDC (2015), paragraphs 8.19–8.20.

³³ Enders Analysis (5 December 2014), *UK broadband, telephony and pay TV trends Q3 2014*.

Table 5: Penetration of bundles that include mobile voice, European countries, 2009 to 2017 quad-play/fixed-mobile bundle comparisons

Country	Operator	Bundle	€/£		%
			Bundle price	individual product	
France*	Orange	Open up	72.9	92.8	21
	Bouygues	Ideo (Bbox Sensation w/Option 2Go)	72.8	87.8	17
	SFR	Carre2Go Multi-pack	66.98	76.98	13
	Iliad	Freebox revolution + mobile (€1 9.99/15.99 pack)	53.96	57.96	7
Spain*	Telefónica	Movistar Fusion	60.38	119.63	50
	Orange	Combina y Ahorra	51.97	62.86	17
UK†	Virgin Media	Classic collection + mobile premiere	69	74	7
	EE	Unlimited home broadband and fixed line calls + mobile (unlimited voice and texts, 1GB data)	65	70	7
	O2	The all rounder + mobile (unlimited voice and texts, 1GB data)	70	75	7

*Prices in Euro.

†Prices in GBP.

64. More current data also suggests that discounting in the UK is modest. Table 6 and Table 7 show the prices offered by BT and TalkTalk to customers that also buy fixed services, and compares them with other prices on the market for contracts with the same or similar data allowances. It shows that none of BT's offers are the cheapest available at the relevant data allowance, while TalkTalk's are modestly cheaper than others in some categories.

Table 6: BT pricing for adding mobile to fixed vs. standalone mobile prices from other operators

Plan	BT price with discount*	Cheaper/closest offers found		BT vs cheapest
		Price	Number of offers	
500 MB	12.50	Three VM (3G) †	11	2.50
2 GB	11	Three giffgaff (4G)	11	-
5 GB	20	Three giffgaff (4G)	18	2.00

Source: Operators' websites (MNOs including giffgaff, and Virgin Media); data gathered August 2015.

*These price include a £5 discount (at each price tier) for consumers in homes that take fixed broadband from BT.

†30 days rolling contract, SIM only.

Note: 12-month contracts, SIM-only.

Table 7: TalkTalk pricing for adding mobile to fixed vs. standalone mobile prices from other operators

Plan	TalkTalk (TT customers, 3G only)*	Cheaper/closest offers found		£
				TalkTalk vs cheapest
200 MB	0 with some plans	Vodafone (250MB) (4G)	11.50	-5
		giffgaff (100MB 3G)	5	
200 MB	5	Vodafone (250MB) (4G)	11.50	0
		giffgaff (100MB 3G)	5	
250 MB	7.90	Vodafone (4G)	9.50	2.90
		Virgin Media (3G)†	5	
300 MB	3.95	Vodafone (250 MB) (4G)	9.50	-3.55
		giffgaff (500MB 3G)	7.50	
700 MB	13	Three (1GB) (4G)	11	5.50
		giffgaff(500MB 3G)	7.50	
1 GB	13	Three (4G)	11	3
		giffgaff (3G)	10	
1.4 GB	15.50	Three (2GB) (4G)	11	3.50
		Virgin Media (2GB 3G)†	12.00	
3 GB	10.50	Three (4GB) (4G)	16	-1.50
		giffgaff (3G)	12.00	
Unlimited	24	Three (4G)	17	4
		giffgaff (3G)	20	

Source: Operators' websites (MNOs including giffgaff, and Virgin Media); data gathered August 2015.

*12 month contract, sim only, except for Talk Talk's £5 200MB plan which is for 30 days

†30 days rolling contracts, SIM only

Note: 12-month contracts, SIM-only, except for TalkTalk's £5 200MB plan which is for 30 days.

Discounts driven by reduced profits

65. Telefónica argued that in the UK, integrated players would be able to promote integrated solutions through aggressive discounts that would make it uneconomic for other providers to compete for the same customers. Telefónica also submitted an internal document that noted [redacted].
66. H3G also submitted that it is concerned that the merged firm would have the ability to cross-subsidise mobile services in the UK from its fixed revenues.
67. BT submitted that 'in countries where fixed-mobile bundles have been successful, demand has been driven by very aggressively priced (compared to individual component pricing) quad-play bundles, which are also compelling for customers by virtue of the quality of services they include'. BT thinks that 'in the UK, this form of deep discounting on compelling bundles is not possible. The low prices that have arisen from intense competition in the UK retail mobile and fixed broadband market mean that the margins are not sufficient for operators to adopt this type of aggressive bundling strategy'.
68. EE argued that growth of fixed mobile bundle demand in the UK is expected to be small as there are two major barriers to the adoption of fixed-mobile bundles:

(a) Customer barriers:

- (i) in the form of individual versus collective/household decision making – the purchasing cycle for mobile is different to fixed services due to factors such as handset launches; and
- (ii) the lack of compelling customer offers beyond price reductions.

(b) UK pricing and hence retail margins are lower than, for example, France giving less scope for pricing disruption by competitive players.

69. This is reflected in EE’s internal documents, which note that the opportunity for quad-play bundles in the UK is more limited than in France and in Spain due to lower margins in the UK. For example: [REDACTED]^{34,35,36}

70. We note, as shown in Figure 3 of Appendix F on retail mobile, that margins in France appear similar to (though slightly higher than) those in the UK, while prices and margins in Spain look substantially higher.

Discounts driven by reduced costs

71. As set out earlier, we have not seen strong evidence that cross-selling of fixed and mobile products necessarily substantially reduces costs. For example, the parties [REDACTED] considered that there are limited cost savings from churn reduction. However, [REDACTED].

72. The value of churn reduction for TalkTalk can be seen through the change in average lifetime customer values (ALVs) as shown in Table 7. Based on an average customer lifetime of [REDACTED] months, this implies that TalkTalk may save around [REDACTED] a month on average per customer, [REDACTED] by adding mobile.

Table 8: [REDACTED]

				£
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]

Source: TalkTalk.

*TalkTalk told us that TalkTalk's current level of churn is around [REDACTED].

³⁴ EE (September 2013), [REDACTED].

³⁵ [REDACTED]

³⁶ [REDACTED]

Other demand-side influences on fixed-mobile bundling

73. Until now, as noted in a [redacted] report submitted by Virgin Media, [redacted].
74. The CMA considered carrying out a consumer survey to investigate consumers' possible future preferences about bundles, but did not do so on the grounds that the necessary questions would have to be theoretical and forward-looking, based on hypothetical behaviour in relation to product offers, marketing and attitudes that do not currently exist, and as such would be unlikely to elicit useful responses.
75. The parties submitted that they believe there will be future demand for fixed-mobile bundles, but that many customers will prefer to keep fixed and mobile unbundled. [redacted]
76. We received some other evidence that highlighted potential barriers to bundling. For example, Analysys Mason noted that bundling was not always attractive to new consumers. An EE document also noted that '[redacted]'. On the other hand, in a presentation prepared for Sky it is noted that in France 'there has been no issue with mobile and [house phone], TV and BB contracts cycles being out of sync as pitch is often "a free SIM for anyone in your family"'.
77. The parties considered that there are significant differences in the way customers buy fixed and mobile services. Fixed telephony services are mostly purchased online or via telesales,³⁷ whereas customers tend to buy mobile services in physical shops. According to Enders Analysis research, 59% of total mobile contract sales are physical shop sales.³⁸ Fixed players, such as BT, TalkTalk and Sky, do not have a developed retail store footprint, which is important in the retail mobile market.
78. TalkTalk used the example of broadband and TV to argue that customers may develop preferences for bundling products that were previously bought separately, although we note that TV and broadband are both household products, in Virgin Media's case delivered over the same line.
79. Even if customers choose to buy fixed and mobile products from the same provider, they may continue to consider them as separate purchases. This may be affected by whether there are contractual or administrative hurdles to 'unbundling'. However, the fixed-MVNOs [redacted]. In the current offers of TalkTalk, Virgin Media, EE and BT, for example, any discount³⁹ offered

³⁷ See, for example, [Enders Analysis, UK broadband, telephony and pay TV trends Q3 2014](#).

³⁸ [Enders Analysis, UK mobile market Q3 2014, Growth maintained, but uncertainty ahead](#).

³⁹ In the case of EE the customer receives additional mobile data allowance.

applies to the mobile product, suggesting that there is no penalty in relation to the fixed product, from switching away for mobile.

80. We received evidence from three surveys that asked consumers about their interest in fixed-mobile bundling. As can be seen in Table 9, the results varied widely, but on balance suggest that consumers are open to the idea of such bundling.⁴⁰

Table 9: Surveys of customer views on bundling

<i>Survey</i>	<i>Question</i>	<i>Results</i>	<i>Sample</i>
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]

Source: Various (see notes).

*[REDACTED]
†[REDACTED]
‡[REDACTED]

81. [REDACTED] We received a number of submissions that argued that the BT/EE merger may itself prompt significant growth in the importance of quad-play in the UK.⁴¹

82. Aside from the benefits offered through existing or currently planned bundles, we received a number of comments and documents which argued that FMC will bring new consumer benefits that depend on combined fixed-mobile offers. With FMC, customers may be unable to identify whether their voice, data, or other service was being carried over a fixed (including broadband) or mobile network. In practice, the customer benefits of this may take a wide variety of forms, for example a ‘converged’ fixed-mobile bundle might provide customers with:

- a common voicemail box rather than two separate boxes corresponding to their fixed and mobile numbers, respectively, that a user could access from any device (eg cell phone, computer, etc);
- simultaneous ‘ringing’ of a customer’s fixed and mobile handsets when a call is placed to either number (or, alternatively, there may be a single number that applies to both devices); and
- improved call quality in buildings, through converged technology of 4G and IP fixed-line networks and femto technology. Unified service for businesses

⁴⁰ Among the surveys we received, [REDACTED] survey seemed to ask the question most relevant for testing consumers’ openness to bundle services as not specific on timing. However, we consider the results presented in all these surveys with caution as we do not have any additional information on the methodology used.

⁴¹ [REDACTED]

that brings together customer's fixed, mobile and phone system into a single cloud-based service, delivered over mobile phones.⁴²

83. On fixed-mobile convergence, [redacted]. EAP-SIM enables automated secure sign-on to amenity Wi-Fi such as in hotels and airports. It is also worth noting that in order to successfully connect it requires both a compatible SIM card and a compatible handset.
84. UK Broadband told us that the mobile market is changing from voice centric to data centric and that there is an increasing convergence of services provided over cellular networks with services provided over Wi-Fi.⁴³
85. Sky also submitted that 'there is [...] growing competition between operators to provide customers with access to converged high data capacity services which can transition between fixed and mobile environments. From a consumer perspective, it is increasingly possible to access the same application on both stationary and mobile devices, which in turn allows for substitution between them depending on the user's situation. Competition will increasingly take place therefore not just over a single network (eg fixed line broadband or mobile) but over hybrid mobility solutions encompassing fixed line SFBB in the home, 4G (or, eventually, 5G) mobile data services and outdoor Wi-Fi networks. Hybrid mobility solutions are therefore becoming increasingly important to future competition in this sector'.
86. A 2014 analyst report⁴⁴ assessing the BT/EE merger concludes that:
- while we argue that quad-play and cross-selling are of limited market importance today, we would concede that on a longer term 5 to 10 years they may well increase in importance, perhaps due to a converged product not yet conceived of, and owning both networks may prove crucial to taking advantage of this.
87. BT submitted that 'this quote is too speculative and it must be considered with caution'.

BT submitted that demand for fixed and mobile bundles remains an area of significant uncertainty, and quoted the Telefónica UK CEO who has recently been quoted as saying 'we are not sure that the customer wants this, instead customer's preference is to choose the best-in-class option rather than to take a bundle'.

⁴² This refers to BT product 'BT One Phone' for businesses. BT highlighted that [redacted].

⁴³ UK Broadband responses to provisional findings, pp1–2.

⁴⁴ [redacted]

Supplementary information related to market definition with respect to fixed-mobile bundles

88. To date the Commission has left open the question as to whether a separate market should be defined for multiple-play offers, comprising for example, fixed internet access, fixed telephony and television (triple-play) or fixed internet access, fixed telephony, television and mobile services (quad-play).⁴⁵
89. Ofcom previously concluded in 2010 that there was insufficient evidence to find that bundles (including triple-play and quad-play bundles) constituted a separate product market.⁴⁶ In its 2014 review of the wholesale broadband access market, Ofcom found that at the retail level ‘it seems likely that there is demand for broadband independent from TV and mobile services, and consumers are likely to be willing to unpick these services from a bundle’.⁴⁷ Ofcom considered that where there is bundling of different services at the retail level, this would create complementarities at the wholesale level rather than substitution.⁴⁸ Ultimately, Ofcom did not conclude on whether bundles were substitutable for independent products as it seemed likely that there was demand for broadband independent from TV and mobile services, and consumers were likely to be willing to unpick these services from a bundle. Furthermore, Ofcom did not believe the retail definition would make a difference to the wholesale product definition.⁴⁹ In its submission to the CMA, in the present case, it reflected its finding in its 2014 review, which recognised the trend towards more bundling.⁵⁰ It ‘note[d] that recent market developments may presage a rapid increase in the importance of competition between providers of bundles’⁵¹ and that competition in bundles will become more important to providers.⁵²
90. We received no submissions which argued that fixed-mobile bundles *currently* constitute a separate market, in which a SSNIP would not be prevented by switching to standalone products. For example:

⁴⁵ [Case M.7018 Telefónica Deutschland/E-Plus](#), recitals 56-59; [Case M.5900 LGI/KBW](#), paragraph 186; [Case M.5734 Liberty Global Europe/Unitymedia](#), paragraph 48.

⁴⁶ Ofcom (2010), [Review of the Wholesale Broadband Access Market](#), paragraph 3.12. See also Ofcom submission, paragraph 1.22.

⁴⁷ Ofcom (2014), [Review of the Wholesale Broadband Access Market](#), paragraph 3.83.

⁴⁸ Ofcom (2010), [Review of the Wholesale Broadband Access Market](#), paragraph 3.50.

⁴⁹ Ofcom (2014), [Review of the Wholesale Broadband Access Market](#), paragraph 3.77. Even if retail consumers were not willing to ‘unpick’ a fixed and broadband bundle, at the wholesale level there was clear substitutability between bundled and unbundled offers, regardless of the situation at the retail level.

⁵⁰ Ofcom (2014), [Review of the Wholesale Broadband Access Market](#), paragraph 3.75.

⁵¹ [Ofcom response to issues statement](#), paragraph 1.22.

⁵² [Ofcom response to issues statement](#), paragraph 1.22.

- (a) TalkTalk stated its belief that: (i) the CMA should evaluate separate product markets for each component of quad-play bundles; and (ii) standalone services and bundles still reside in the same product market.
- (b) O2 submitted that defining a separate product market for fixed-mobile bundles would require a prospective form of analysis rather than analysis of the market as it exists today.

Wholesale mobile: Total foreclosure – Incentives analysis

1. This appendix presents our vertical arithmetic analysis on the merged entity's incentives not to bid for MVNO contracts. The analysis comprises two parts:
 - (a) We first present a model that can be applied to the foreclosure of all MVNOs that also offer fixed communication services.
 - (b) We then elaborate a model that applies specifically to the case of Virgin Media.

Foreclosure of all MVNOs offering fixed communication services

2. The merging parties commissioned an economic analysis of theory of harm 3. In this context, its advisers elaborated a vertical arithmetic model to assess the merged entity's incentive to withhold access to its network to MVNOs. The model assumes that all MVNOs that also offer fixed communication services are foreclosed.¹
3. BT's advisers correctly noted that the theory of harm based on total foreclosure relied on a causal chain involving a number of steps:
 - (a) The merged entity withholds MVNO access to one or more MVNOs.
 - (b) This would have to increase the costs of the MVNO(s).
 - (c) The MVNO(s) would have to pass through some of the increase in costs in the form of an increase to its (their) retail prices and, as a consequence, lose some customers.
 - (d) The merged entity would have to recapture sufficient downstream business to compensate it for the loss of upstream margin.
4. BT's advisers sought to calculate the price increases that would need to occur in order for BT/EE's downstream gains to exceed the upstream sacrifice of wholesale profits. These calculations depended on assumptions about price elasticity, BT/EE's recapture rates, and the value to BT/EE of the lost wholesale business and gained retail business.
5. First, BT's advisers estimated the percentage increase in the MVNOs' retail price that would lead to the MVNO losing sufficient customers downstream

¹ The model, however, can be extended to cases in which only some MVNOs are foreclosed.

such that the downstream gains exceed the upstream sacrifice. Expressed algebraically, this is the change in price ($\frac{\Delta P}{P}$) that satisfies the following:

$$\text{Upstream sacrifice} = \frac{\Delta P}{P} \times \text{Elasticity} \times \text{Recapture rate} \times \text{Recapture margin}$$

where the upstream sacrifice is the product of EE's upstream margin in the wholesale mobile market and the probability that, in the counterfactual, it would win the contract to host the MVNOs under considerations:

$$\text{Upstream sacrifice} = \text{wholesale margin} \times \text{probability of winning contract}$$

6. Given the ratio between the MVNOs' retail price (P) and their current wholesale access price (W), BT's advisers then calculated the required percentage increase in the wholesale access price. Expressed algebraically:

$$\frac{\Delta W}{W} = \frac{\Delta P}{P} \times \frac{1}{\text{Pass-through rate}} \times \frac{P}{W}$$

7. The equations above can be captured in the following single equation:

$$\frac{\Delta W}{W} = \frac{\text{wholesale margin} \times \text{probability of winning contract}}{\text{Elasticity} \times \text{Recapture rate} \times \text{Recapture margin}} \times \frac{1}{\text{Pass-through rate}} \times \frac{P}{W}$$

8. The actual estimation of the required percentage increase in the wholesale access price is more complicated than the formula above suggests, for a series of reasons:
- (a) MVNOs' retail customers may be buying mobile services only, or both fixed and mobile services; the demand from these groups of customers may exhibit different elasticities; moreover, the merged entity's recapture rates and recapture margins are likely to be different.
 - (b) MVNOs' retail customers that are currently purchasing fixed and mobile services from the same provider will vary in the way they respond to a retail price increase:
 - (i) Some of them would remain with their current providers.
 - (ii) Others would switch to a different provider for the entire bundle.
 - (iii) Others would unbundle, continuing to purchase the fixed services from the foreclosed MVNO, but switching to a different provider for mobile services.

- (c) All providers of fixed communication services other than Virgin Media make use of Openreach inputs; this means that when a Virgin Media's fixed-mobile bundle customer switches to another provider, the merged entity gains the margin on the inputs sold by Openreach, and conversely, if a customer switches to a bundle sold by Virgin Media, the merged entity loses the Openreach margin.
9. BT's advisers recognised some of these aspects, but ignored others. The analysis considered the possibility that purchasers of bundles may unbundle following a retail price increase, but did not consider the coexistence of mobile-only customers and purchasers of bundles. As a consequence, it adopted the same elasticity for all customers. Moreover, the base case did not take Openreach margins into account.²
10. We have expanded the model submitted by BT to account for all the above variables. The result, therefore, depends on the values of a large number of parameters:
- (a) The ratio of mobile-only versus fixed-mobile customers.
 - (b) The ratio of fixed-mobile customers that would consider switching only to another fixed-mobile bundle versus those that would unbundle in response to a sufficient price increase.
 - (c) The price elasticity of demand, for mobile services and for fixed-mobile bundles.³
 - (d) The merged entity's recapture rates, for mobile-only and fixed-mobile customers (ie the proportion of customers that choose to leave the MVNO that are recaptured by BT/EE).
 - (e) The recapture margins, on mobile services and fixed-mobile bundles.
 - (f) The wholesale mobile margin.
 - (g) The probability that, in the counterfactual, EE would win the contract to host the MVNOs.
 - (h) The pass-through rate of wholesale access price increases into retail prices.

² Openreach margins were accounted for in a sensitivity.

³ We should ideally also determine which of the two elasticities should be applied to fixed-mobile customers who are willing to unbundle.

- (i) The ratio between retail prices and wholesale access prices, for both mobile services and fixed-mobile bundles.
 - (j) The margin earned by Openreach on customers buying fixed communication services from providers other than Virgin Media.
 - (k) The probability that a fixed-mobile customer from an MVNO other than Virgin Media would divert to Virgin Media in case of foreclosure.
11. Estimating the required percentage increase in the wholesale access price that would make foreclosure profitable does not by itself answer the question of whether the merged entity would have an incentive to foreclose. The last step of the analysis is assessing whether, given the remaining level of competition in the wholesale mobile market, the required wholesale price increase is likely.
 12. In this section we summarise the evidence we have collected on some of the parameters mentioned in paragraph 10. We then observe how the choice of values dramatically changes the estimate of the required percentage increase in the wholesale access price.

Price elasticity of demand

13. The analysis submitted by the parties did not attempt to estimate separate firm/product-specific elasticities for each of the fixed MVNOs. While the report did not advocate a specific value of the elasticity of demand, it considered a range of values (between 2 and 10 in absolute value) in assessing the merged entity's incentive to foreclose all fixed-MVNOs post-merger.
14. TalkTalk and Virgin Media provided estimates for their firm-specific elasticities of demand for mobile services and fixed communication services.

Mobile-only services

15. For mobile-only services, TalkTalk estimated its own short-run price elasticity of demand [X]:
 - (a) [X]
 - (b) [X]
16. [X]
17. Virgin Media estimated its own elasticity of demand to be between [X] and [X] in absolute value, depending on the type of mobile contract. Estimates were based on internal analysis from recent re-pricing activities within Virgin

Media. Virgin Media, however, noted that competitors' pricing and discounts were regularly updated and had a significant impact on Virgin Media customers' response to price changes.

18. In view of this evidence, we consider that values between [X] and [X] are reasonable estimates of the elasticity of demand for standalone mobile services.

Fixed-only services

19. Although our model does not consider fixed-only customers, estimates of the elasticity of demand for fixed communication services may be useful in assessing elasticities for fixed-mobile bundles.
20. TalkTalk estimated its own demand elasticity for broadband services by comparing promotion periods to full price periods for its Simply Broadband product. [X]:

(a) [X]

(b) [X]

21. [X]
22. Virgin Media obtained a [X] value for the elasticity of demand for its own fixed communication services, estimated at [X] in absolute value.
23. The data we have received suggests that demand elasticity for fixed-only services varies [X] among providers. In particular, demand for [X]. This is likely to reflect the different characteristics of the parties' offers, [X].

Fixed-mobile bundles

24. We have not received direct evidence from third parties about the elasticity of demand for fixed-mobile bundles. This is due, in part, to the currently limited uptake of these bundles.
25. Sky suggested theoretical reasons why demand for bundles should be expected to be more elastic than demand for one of its components, including the following in particular:
 - (a) While the cost of switching one element of the bundle may be lower than the cost of switching bundle provider, some of the costs of switching are common to both elements, so one might expect that (as a proportion of price) the switching cost would be lower for the bundle than for one of its components. From this the CMA infers that demand for bundles may not

be less elastic than the demands for both the fixed and the mobile components; however, it does not exclude the possibility that the elasticity for bundles may be lower than that for one of the components.

(b) Customers may be expected to be more 'bunched' around the market boundary (ie more price sensitive) when firms compete in bundles than when they sell separate components. This follows because when consumers can purchase on a standalone basis they will likely choose the provider they prefer most on an element-by-element basis (making them resistant to switching in response to a price increase). In contrast, when they buy a bundle, they will likely have to have made a compromise (eg choosing their preferred mobile provider while accepting a less-than-ideal fixed telephone service). The CMA infers that this could make them more 'switchable' (ie their demand more elastic) in response to a price increase. However, we consider that this argument does not exclude the possibility that demand for bundles be less elastic than the more elastic of the demands for the two components.

26. Sky's arguments are somewhat reflected by [redacted] expectation on the elasticity of demand for its own fixed-mobile bundles. [redacted] in fact, told us that it expected the elasticity for fixed-mobile bundles to be [redacted].
27. Finally, we must consider how to model the behaviour of those customers of fixed-mobile bundles that are willing to unbundle following a sufficient price increase. If they perceive the bundle as such, they would respond to a price increase looking at its impact on the price of the entire bundle. On the other hand, if they see themselves as simply buying two separate products from the same provider, they might react to a price increase by simply looking at its impact on the price of the mobile component of the bundle.⁴ The analysis submitted by the parties adopted the first approach.

Recapture rates

28. The merged entity is unlikely to recapture all the customers who switch away from a foreclosed MVNO. The expected recapture rate depends on the type of switching customers.
 - *Unbundling and mobile-only customers*
29. In the case of MVNO customers who unbundle in response to a price increase and look for a new provider only for the mobile component of the bundle, the

⁴ In this second case, Sky's argument in paragraph 24(b) suggests that their demand may be more elastic than that from customers buying mobile services separately.

parties' analysis assumed that the proportion recaptured by the merged entity would be proportional to its market share in the retail mobile market (corrected by excluding the shares of the foreclosed MVNOs), which is approximately [REDACTED]%.⁵

30. We consider that such a recapture rate is reasonable for both the unbundling customers and the MVNOs' mobile-only customers. Alternatively, we might look at historical switching data from the MVNOs to EE. Data from Virgin Media, for example, shows that the diversion rate of mobile customers to EE between December 2014 and May 2015 was [REDACTED]%.⁵ Such an approach, however, cannot be adopted in relation to Sky, as Sky has not launched its mobile services yet.

- *Non-unbundling customers*

31. The analysis submitted by the parties assumed that the merged entity would recapture 50% of those switching customers who do not unbundle; the assumption was defined as 'conservative'.

32. In its response to the analysis submitted by the parties, TalkTalk told the CMA that, for customers that take bundles of fixed products, the pre-merger diversion of from TalkTalk to BT and EE was [REDACTED]%. TalkTalk then argued that the post-merger diversion of fixed-mobile bundle customers would be higher than that, because:

(a) other competitors would be foreclosed; and

(b) the number of providers of fixed-mobile bundles was lower than that of providers of fixed-only services.

33. TalkTalk therefore suggested that the merged entity's recapture rate of fixed-mobile bundle customers switching away from TalkTalk would be above [REDACTED]%, and probably at [REDACTED]% or higher.

34. Alternative approaches are to look at the historical switching data for fixed services from the MVNOs to BT, or forecast shares of supply of fixed-mobile bundles. These are shown in Table 1 below.

⁵ CMA calculations.

Table 1: Estimates of diversion to BT for fixed-mobile bundles

Originating MVNO	Based on current switching in fixed services		Implied by shares of supply that follow from forecasts of customers buying fixed and mobile services from the same supplier in 2019 absent the merger (largest suppliers)	
	Diversion to BT	Diversion to BT excluding the other MVNOs listed	Implied diversion to BT	Implied diversion to BT excluding the other MVNOs listed
TalkTalk*	[X]	[X]	[X]	[X]
Sky†	[X]	[X]	[X]	[X]
Virgin Media‡	[X]	[X]	[X]	[X]

Source: CMA calculations from data provided by TalkTalk, Sky and Virgin Media. See also Table 3 in Annex H (Fixed-Mobile bundles).

* Average diversion between February and May 2015.

† Average diversion between October 2014 and March 2015.

‡ Average diversion between October 2014 and April 2015.

Notes:

1. The figures exclude 'don't knows' or 'no longer purchasing'.

2. Virgin Media did not provide data on other operators.

3. TalkTalk argues that 'other' operators do not offer fixed mobile bundles, or would be foreclosed if they did.

35. Under these approaches, the choice of recapture ratio depends on the identity of the MVNO(s) that we consider the merged entity may be trying to foreclose.

Recapture margins

36. As noted above, should the merged entity adopt a total foreclosure strategy, and customers as a result switch from MVNOs offering fixed-mobile bundles towards offerings of the merged entity, then these customers will purchase one or more services from the merged entity (possibly in the form of a bundle). Each of those services will have associated with it a profit margin defined as the difference between the retail price of the offering and the marginal (or incremental) cost (including the incremental customer acquisition cost) associated with providing the service. All else equal, the merged entity's incentive to totally foreclose MVNOs will be greater the higher is the profit margin on each service that it ultimately sells to the switching customers.

37. As estimates of recapture margins, the analysis submitted by the parties used BT's post-merger expected gross margins on standalone mobile (£[X]) and on fixed-mobile bundles (£[X]). The choice of using gross margins was mainly due to lack of data on variable margins for the fixed component.

38. We consider that using gross margins significantly overestimate the incremental profits that the merged entity may expect from recaptured retail customers. Gross margins do not take into account any of the costs associated with a new customer other than those direct costs of sales (in the case of mobile, only interconnect and roaming charges). However, acquiring, servicing and retaining customers is not costless today and it would not be costless in the future. These costs are subtracted when computing average variable margins. In particular:

- (a) average short-run variable margins exclude costs that could have been saved if a provider had known 12 months in advance that there would have been a hypothetical permanent decrease in the number of subscribers (as well as a proportional decrease in new subscribers and in the traffic linked to subscribers); and
- (b) average long-run variable margins exclude costs that could have been avoided had the provider known about the hypothetical permanent decrease in the number of subscribers long enough in advance so that even infrastructure could have been adjusted to avoid unnecessary investments.

39. Therefore, the advantage of using the average variable margins over gross margins is that it illustrates the potential increases in costs that the merged entity would face if its subscriber base increased as a result of the foreclosure strategy. We consider that average long-run variable margins are the most appropriate choice when estimating recapture margins.
40. Table 2 shows EE’s average long-run variable margins (per customer per month) on mobile-only services. We consider that EE’s pre-merger margins are a good proxy for the merged entity’s margins on standalone mobile services.⁶

Table 2: EE’s average long-run variable margins (per customer per month) on mobile-only services

£			
Post-pay	Pre-pay	Business	Average
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]

Source: EE response to EE6 – Appendix 3 (Q14).

Note: EE considers that its long-run variable margins should be computed, unlike the figures in the table, including in the incremental costs the proportion of depreciation that is avoidable. That approach would result in lower margins.

41. As we are mainly interested in residential customers (since these are the primary focus of Virgin Media, Sky and TalkTalk in relation to mobile), we consider that £[REDACTED] per customer per month is a reasonable upper bound on the merged entity’s recapture margin on mobile-only customers.
42. Table 3 shows BT’s average long-run variable margin for its fixed voice and broadband services. Of the two merging parties, BT is the largest provider of fixed voice and broadband. As such, we consider that BT’s current long-run variable margins are a good proxy for the merged entity’s margins for fixed

⁶ The merger may lead to cost efficiencies possibly reducing EE’s costs, especially in relation to mobile backhaul. However, given the small proportion of EE’s costs due to backhaul and the fact that a large fraction of backhaul costs is fixed (see Appendix K) we consider that post-merger variable margins will not be much different from pre-merger values.

voice and broadband. For the same reasons as outlined in paragraph 39, we consider that the long-run variable margins are the most appropriate choice when estimating recapture margins.

Table 3: BT's average long-run variable margins (per customer per month) for fixed voice and fixed broadband services

£	
<i>Fixed voice</i>	<i>Broadband</i>
[REDACTED]	[REDACTED]

Source: [REDACTED].

43. By combining EE's mobile margin with BT's fixed voice and broadband margins, we estimate that the merged entity's recapture margin for fixed-mobile bundles will be £[REDACTED] per customer per month.

Wholesale mobile margin

44. The analysis submitted by the parties assumed a value of £[REDACTED] for EE's wholesale mobile margin; this corresponds to EE's direct wholesale margin. BT's advisers used this value instead of EE's average short-run variable margin (£[REDACTED]) or average long-run variable margin (£[REDACTED]), as it considered it more comparable to the gross margins used in its analysis to estimate the merged entity's downstream recapture margin (see paragraph 37).
45. We consider that the long-run variable margin may be a better estimate, as it takes into account the investment costs that EE will have to make to service its MVNO customers in the future. This is consistent with what we set out earlier in relation to downstream margins.

Probability of EE winning the wholesale contract

46. The model submitted by the parties assumed that, in the counterfactual, EE would win the wholesale contracts with probability one-third.
47. We note that different values may be used. As a first approximation, it might be reasonable to assume that EE's probability of winning a given MVNO hosting contract is proportional to the total number of MNOs that may be competing for the opportunity. As there are nominally four MNOs competing at any one time for a given contract, we start with a probability of 25%. However, if other MNOs were not as strong bidders as EE, the lower resulting level of wholesale competition would lead to a higher probability for EE of winning the contracts.
48. Moreover, in the case of Virgin Media, at contract renewal EE would be the incumbent access provider and, as a result of Virgin Media's switching costs,

this might further increase EE's probability of winning the contract (especially if Virgin Media were still a light MVNO).

49. We therefore consider that probabilities up to 50%, or even higher in the case of Virgin Media, may still be reasonable.

Pass-through

50. BT's advisers did not try to estimate the expected pass-through of increases in the wholesale access price, but considered different possible values, up to a maximum of 50%. It then argued that a high pass-through rate was unlikely, as the MVNOs would have found it unprofitable. The argument, however, is flawed. In the analysis submitted by the parties, MVNOs' margins are not linked to their elasticity of demand. For high values of elasticity, the assumed margins are higher than what would be implied by profit maximisation, with the result that any pass-through of a small increase in variable costs becomes unprofitable.
51. TalkTalk, on the other hand, argued that pass-through above 60% was likely in the industry, because existing margins are not high enough to allow operators to absorb cost increases; [redacted].
52. We note that, in general, pass-through depends on the characteristics of the demand function. For example, under linear demand pass-through is always 50%; under isoelastic demand, pass-through depends on elasticity, but is always higher than 100%. We consider that pass-through values between 50% and 100% may be reasonable.

The ratio between retail prices and wholesale access price

53. The wholesale access price is the price that an MNO charges an MVNO for access to its network; it is individually negotiated between the MNO and the MVNO and is usually proportional to the volume of the MVNO's mobile traffic.
54. The model submitted by the parties used a wholesale access price of £[redacted] per customer per month, which corresponded to the average price EE charged MVNOs. Different MVNOs, however, may pay very different amounts, depending on their contractual terms and on the traffic generated by their mobile customers. For example, BT pays EE an average of £[redacted] per customer per month, while Virgin Media pays approximately £[redacted].⁷

⁷ CMA calculations [redacted].

55. BT's advisers estimated MVNOs' retail prices using ARPU for BT's standalone mobile (£[redacted] per customer per month) and for its mobile, broadband and fixed voice bundle (£[redacted] per customer per month). In the case of Virgin Media, however, we may want to use the (quite similar) ARPU for Virgin Media's own services.
56. Table 5 summarises the ratios between retail prices and wholesale access price for different choices of inputs prices and bundles.

Table 4: Ratio between retail prices and wholesale access price

	%		
	<i>Estimate in BT's model</i>	<i>BT pre- merger</i>	<i>Virgin Media</i>
Standalone mobile	[redacted]	[redacted]	[redacted]
Mobile, broadband and fixed voice	[redacted]	[redacted]	[redacted]
Mobile, broadband, fixed voice and TV	[redacted]	[redacted]	[redacted]

Source: Report submitted by BT and CMA calculations based on data provided by BT's advisers and Virgin Media.

Openreach margins

57. The base case in the analysis submitted by the parties did not take into account the Openreach margin gained on Virgin Media's customers diverting to other providers of fixed services (or lost if customers diverted to Virgin Media). However, it was included in a sensitivity analysis, assuming a value of £[redacted] for Openreach variable margin per month for the provision of fixed inputs; this was based on an Openreach estimate.
58. In its response to the analysis submitted by the parties, TalkTalk disagreed with this estimate, noting that, at its most basic level, BT Retail's core copper product is WLR, while for a fibre product (a growing majority of new BT customers) a customer purchases GEA and WLR together:
- (a) Each WLR customer yields £7.46 per month, of which around 43% is the long run incremental cost (LRIC), leaving Openreach with incremental margins of £4.25 per month per switching customer.
 - (b) Each GEA customer additionally yields around £7.40 per month, of which around £0.74 is LRIC, leaving Openreach with incremental margins of around £6.66 per switching customer.

This leads to an Openreach margin of £4.25 for broadband customers, and of £10.91 for superfast broadband customers.⁸

59. Using TalkTalk's estimates, and assuming that [X]% of diverted customers would purchase superfast broadband services,⁹ Openreach's expected variable margin per month would be £[X].

Fixed switching to and from Virgin Media

60. It is reasonable to assume that, in case of foreclosure of Virgin Media, the Openreach margin would be gained on all the customers that switch to fixed-mobile bundles offered by other providers, since all providers other than Virgin Media make use of Openreach inputs.¹⁰
61. In case of foreclosure of TalkTalk or Sky, the assumption on how many customers would switch to Virgin Media is linked to the assumed recapture rate by the merged entity (see paragraphs 31 to 35).
62. In the example scenarios below we assume that 50% of affected customers are those of Virgin Media, reflecting the fact that it is currently the largest MVNO.¹¹

Possible estimates of the required percentage increase in the wholesale access price

63. Given the high number of variables entering the estimation and the significant uncertainty around their values, the model generates a wide range of estimates for the percentage increase in wholesale access price that would make foreclosure profitable.
64. The following tables provide some examples. Table 5 illustrates two of the scenarios submitted by BT, in which a) no customers purchase bundles, and b) all customers purchase bundles, and assuming that the merged entity would recapture [X]% of unbundling customers and 50% of bundle

⁸ We note that, in case of diversion from Virgin Media to providers other than BT Retail, the Openreach margin could be somewhat lower, as local-loop unbundlers may pay a lower incremental price to Openreach than BT Retail does.

⁹ This was the approximate proportion for BT Retail in Q4 2014.

¹⁰ Although the base case submitted by the parties did not take into account Openreach margin, the case was considered as a sensitivity. In doing that, however, the parties' analysis implicitly assumed that Openreach's margin would be gained only on 50% of the fixed-mobile customers lost by Virgin Media.

¹¹ However, we note that the conclusions of the analysis do not differ substantially depending on this assumption – the necessary price rise still depends strongly on the future extent and nature of fixed-mobile bundles. If 100% of affected customers were at Virgin Media, our estimate of the wholesale price rise necessary to make it profitable for the merged entity not to bid for Virgin Media's contract ranges from 78% to 234% depending on assumptions about these factors, compared to 94% to 247% if no affected customers began at Virgin Media (or equivalently, if Openreach margins were zero).

customers that do not unbundle (scenarios 1 and 3 in its report). We have also added a counterfactual scenario based on scenario 3 submitted by the parties, but adding some (low) recapture by EE of bundle customers.

Table 5: Required percentage increase in the wholesale access price under scenarios submitted by the parties

	Scenario 1 submitted by the parties	Scenario 3 submitted by the parties	
	No bundles	Counterfactual with bundles	Post-merger with bundles
% of MVNO customers buying bundles	0%	100%	100%
% of switchers who unbundle†	n/a	50%	50%
<i>Price elasticity</i>			
Mobile	-4*	-4*	-4*
Bundles	-4*	-4*	-4*
<i>Recapture rates</i>			
Mobile	[X]	[X]	[X]
Bundles	n/a	8%	50%
<i>Recapture margins</i>			
Mobile	[X]	[X]	[X]
Bundles	n/a	[X]	[X]
Wholesale mobile margin	[X]	[X]	[X]
Probability of EE winning the MVNO contract	33%	33%	33%
Pass-through	30%*	30%*	30%*
<i>Ratio of retail/wholesale prices</i>			
Mobile	[X]	[X]	[X]
Bundles	n/a	[X]	[X]
Openreach margin	n/a	n/a	n/a
Probability that the switching customer comes from Virgin Media	n/a	n/a	n/a
<i>Diversions</i>			
From Virgin Media to a provider using Openreach	n/a	n/a	n/a
To Virgin Media	n/a	n/a	n/a
Required increase in wholesale access price	99%†	345%	125%

Source: CMA calculations from data included in the analysis submitted by the parties.

Notes:

*The parties' advisers also considered different values of demand elasticity and pass-through. The values in the table were used in an example calculation (Table 8 in the report submitted by the parties).

†The figure is slightly higher than the one obtained by the parties' advisers ([X]%). We think the discrepancy is the result of different approaches to rounding the parameter values.

65. The next two tables consider alternative sets of parameter values, within the ranges we consider plausible. Table 6 shows an example characterised by a wide adoption of fixed-mobile bundles, a low tendency of switchers to unbundle and a high recapture rate for bundles. The scenario in Table 7 presents less frequent bundling, a high propensity to unbundle, and a lower recapture rate for bundles.¹² In each table we compare a post-merger scenario with the following:

- (a) A pre-merger scenario in which we assume that 50% of MVNO customers buy fixed-mobile bundles, but all of them would unbundle if deciding to switch. This reflects the approximate proportion of Virgin Media's mobile

¹² In all these scenarios, we assume that the unbundling customers respond to a retail price increase in proportion to the percentage increase in the combined retail price of the entire bundle.

customers who also buy fixed services, and the fact that fixed-mobile bundles offered by other providers are not very popular. This differs from scenario 1 submitted by the parties, where it was assumed that all customers purchased mobile only.

- (b) The corresponding counterfactual scenario, where the only difference with the post-merger situation is about the recapture rate for bundle customers. We therefore assume that the merger does not influence the rate of adoption of bundles nor customers' preferences towards unbundling (although these factors do vary between pre-merger and the counterfactual). In the counterfactual, we assume that EE would recapture [redacted]% of the switching customers who look for another fixed-mobile bundle ([redacted]% is EE's share of the retail broadband market once Virgin Media is excluded).

Table 6: CMA modelling of required percentage increase in the wholesale access price in a scenario with wide adoption of bundles, low tendency to unbundle and high recapture rate

	<i>Pre-merger</i>	<i>Counterfactual</i>	<i>Post-merger</i>
% of MVNO customers buying bundles	50%	80%	80%
% of switchers who unbundle	100%	20%	20%
<i>Price elasticity</i>			
Mobile	[redacted]	[redacted]	[redacted]
Bundles	[redacted]	[redacted]	[redacted]
<i>Recapture rates</i>			
Mobile	[redacted]	[redacted]	[redacted]
Bundles	n/a	[redacted]	90%
<i>Recapture margins</i>			
Mobile	[redacted]	[redacted]	[redacted]
Bundles	n/a	[redacted]	[redacted]
Wholesale mobile margin	[redacted]	[redacted]	[redacted]
Probability of EE winning the MVNO contract	50%	50%	50%
Pass-through	50%	50%	50%
<i>Ratio of retail/wholesale prices</i>			
Mobile	[redacted]	[redacted]	[redacted]
Bundles	[redacted]	[redacted]	[redacted]
Openreach margin	n/a	n/a	[redacted]
Probability that the switching customer comes from Virgin Media	n/a	n/a	50%
<i>Diversions</i>			
From Virgin Media to a provider using Openreach	n/a	n/a	100%
To Virgin Media	n/a	n/a	0%
Required increase in wholesale access price	308%	478%	85%

Source: CMA calculations.

Table 7: CMA modelling of required percentage increase in the wholesale access price in a scenario with less frequent bundling, high tendency to unbundle and lower recapture rate

	<i>Pre-merger</i>	<i>Counterfactual</i>	<i>Post-merger</i>
% of MVNO customers buying bundles	50%	50%	50%
% of switchers who unbundle†	100%	80%	80%
<i>Price elasticity</i>			
Mobile	-2.5	-2.5	-2.5
Bundles	-2.5	-2.5	-2.5
<i>Recapture rates</i>			
Mobile	[∞]	[∞]	[∞]
Bundles	n/a	[∞]	60%
<i>Recapture margins</i>			
Mobile	[∞]	[∞]	[∞]
Bundles	n/a	[∞]	[∞]
Wholesale mobile margin	[∞]	[∞]	[∞]
Probability of EE winning the MVNO contract	50%	50%	50%
Pass-through	50%	50%	50%
<i>Ratio of retail/wholesale prices</i>			
Mobile	[∞]	[∞]	[∞]
Bundles	[∞]	[∞]	[∞]
Openreach margin	n/a	n/a	[∞]
Probability that the switching customer comes from Virgin Media	n/a	n/a	50%
<i>Diversions</i>			
From Virgin Media to a provider using Openreach	n/a	n/a	100%
To Virgin Media	n/a	n/a	0%
Required increase in wholesale access price	308%	312%	240%

Source: CMA calculations.

66. As is clear from the examples above, the increase in wholesale access price that makes foreclosure profitable is lower post-merger than in the counterfactual, but varies dramatically with the values of the model's parameters. In particular, the estimate is very sensitive to
- (a) the percentage of MVNO customers who buy bundles;
 - (b) switching customers' propensity to unbundle; and
 - (c) the recapture rate.¹³
67. The higher the recapture rates, and the less unbundling there is, the lower is the necessary wholesale price rise or quality degradation. For sufficiently low unbundling and high recapture, higher prevalence of customers buying fixed and mobile from the same provider will also reduce the necessary wholesale price rise.
68. These factors are discussed in Chapter 13 of the Report.
69. We also note that while in scenarios submitted by the parties, the necessary price rise became higher when the extent of assumed bundling increased, this

¹³ We have also considered different values for Openreach margin, the likelihood that a switching customer comes from Virgin Media, and diversion to Virgin Media. Results are not very sensitive to changes in these values.

is not seen in the examples in Table 6 and Table 7 above. The primary reason for this is that these examples include a higher rate of recapture in bundles than was used under the parties' approach.

70. The parties and some third parties commented that the parameter values used in the examples in Table 6 and Table 7 might not be the most appropriate, or that different values within the ranges that the CMA considered reasonable implied significantly different estimates for the increase in wholesale access price that made foreclosure profitable.
- (a) Sky observed that assuming a demand elasticity of [X] and a pass-through rate of [X]% reduced the critical cost increase in Table 6 from 85% to 30%.¹⁴
 - (b) TalkTalk used parameter values that reflect the specificities of its own case ([X]% of MVNO customers buying bundles, price elasticity of [X], [X]% recapture rate for bundles and pass-through of [X]%), obtaining a critical cost increase of [X]% in Table 6.¹⁵
 - (c) The parties told the CMA that the assumption of 60% to 90% bundle recapture rate was excessively conservative. In addition, as the strategy analysed involved the foreclosure of multiple fixed-MVNOs, the relevant elasticity would be between the firms' elasticity (which the CMA had tried to estimate) and the lower industry-level elasticity. The CMA might therefore have overestimated the actual elasticity.¹⁶
71. We are aware of the uncertainty around the values of the parameters used in our vertical arithmetic analysis. In the absence of clear evidence on the values of some parameters, we consider that the choices suggested by the merging parties and third parties may be as reasonable as the ones we made, widening the range of possible values for the increase in wholesale access price that makes foreclosure profitable.

Strategic incentives to foreclose

72. The merged entity's incentive to foreclose may be somewhat higher than what is implied by our vertical arithmetic model as a result of strategic considerations. In particular, TalkTalk suggested [X]. TalkTalk, in a joint venture with Sky and CityFibre, is rolling out a trial FTTH network in York.

¹⁴ Sky [response to provisional findings](#), Annex 1, paragraph 68.

¹⁵ TalkTalk [response to provisional findings](#) – confidential annex, paragraph 3.5, and Oxera's spreadsheet.

¹⁶ BT/EE [response to provisional findings](#) – Conservative assumptions used by the CMA in the vertical arithmetic for wholesale mobile and mobile backhaul, paragraph 2.3.

Should this be profitable, TalkTalk intends to roll out similar networks in additional areas, covering up to a third of its customer base. [REDACTED].¹⁷

73. If these considerations were included into our vertical arithmetic model, they would decrease the estimate of the increase in wholesale access price that makes foreclosure profitable. TalkTalk created a model which takes these strategic incentives into account, leading to a reduction of the estimate in Table 6 [REDACTED] and of that in Table 7 [REDACTED].¹⁸ Although we have some reservations about the methods used by TalkTalk to quantify this effect,¹⁹ we consider that the results do not decrease the uncertainty around the estimate.

Foreclosure of Virgin Media

74. Among the MVNOs (other than BT) offering both mobile and fixed communications services, only Virgin Media is currently hosted on EE's network. Moreover, as we described in Chapter 14:

(a) [REDACTED]

(b) [REDACTED]

75. [REDACTED]

76. In this section we consider whether, [REDACTED], the merged entity would, [REDACTED], have an incentive not to bid for a new MVNO contract. However, we note that [REDACTED].

77. Below, we compare the merged entity's profits under a contract with similar terms as the current one and the expected profits it would get by not bidding for a new contract [REDACTED], we assume that, in case of no bid from the merged entity, Virgin Media would lose the proportion of customers indicated above, and that some of them would be recaptured by the merged entity. However, unlike the model described in the previous section, we do not take into consideration the possibility that the new contract signed by Virgin Media with a different MNO might be more onerous than the current one, and that therefore Virgin Media's mobile offers could become less competitive. If that were the case, the merged entity might have an increased incentive not to bid.

78. The merged entity's incentives depend on the wholesale margin gained on Virgin Media's mobile customers under an MVNO contract, on the proportion

¹⁷ [TalkTalk response to provisional findings](#) – confidential annex, paragraphs 4.5–4.7.

¹⁸ *ibid*, paragraph 4.9.

¹⁹ In particular, demand for bundles including FTTH broadband services can be expected to have a different (and probably lower) price elasticity than demand for bundles including SBB, as such a product would be a less close substitute to what is offered by competitors. Using lower levels of elasticity would increase the estimate of the increase in wholesale access price that makes foreclosure profitable.

of Virgin Media’s customers who would switch to the merged entity if Virgin Media had to change mobile network (recapture rates) and on the retail margins earned from them, and on the Openreach margins on Virgin Media’s fixed customers who switch to another fixed communications provider. Incentives also depend on the proportion of Virgin Media’s mobile customers currently purchasing a fixed-mobile bundle and, among them, the proportion who would unbundle in the case of disruption to Virgin Media’s mobile services; that is, the proportion of customers who would switch mobile operator, but would continue to purchase fixed communication services from Virgin Media. Our model estimates, for given values of the other parameters, the proportion of ‘unbundling’ customers that would make it profitable for the merged entity not to bid.

79. In the choice of parameter values, we have been consistent with the estimates used in the model presented in the previous section, but we have adapted some values to the specificity of Virgin Media’s case:
- (a) The wholesale mobile margin is EE’s long-run variable margin of £[X] (see paragraph 45).
 - (b) Retail recapture margins are computed by combining EE’s average long-run variable margins on mobile services and BT’s average long-run variable margins on fixed services (see Table 2 and Table 3); the implied margins are given in Table 8 below.

Table 8: Retail recapture margins

	£	
	<i>Mobile only</i>	<i>Fixed-mobile bundles</i>
Pre-pay mobile	[X]	[X]
Post-pay mobile	[X]	[X]

Source: EE and CMA calculations.

- (c) The proportion of Virgin Media’s pre- and post-pay mobile customers currently buying a fixed-mobile bundle has been computed using data provided by Virgin Media.
- (d) We have used the same Openreach margin as in the previous model: £[X].
- (e) We have assumed a recapture rate for mobile-only customers proportional to EE’s market share ([X]%), although data provided by Virgin Media shows that diversion to EE is lower; we have run the model using different recapture rates for fixed-mobile customers.

80. The following table summarises our results. If the recapture rate for fixed-mobile customers is assumed to be low (for example, 60%), then it is never profitable for the merged entity not to bid. Even if the recapture rate were very high (for example, 90%), the merged entity would find it profitable not to bid only if the percentage of Virgin Media's fixed-mobile switching customers that decided to unbundle was particularly small.

Table 9: CMA modelling of unbundling rates that would make it profitable for the merged entity not to bid

	<i>Low recapture rate</i>	<i>High recapture rate</i>
<i>Recapture rates</i>		
Mobile	[X]	[X]
Bundles	60%	90%
<i>Retail margins</i>		
Pre-pay mobile	[X]	[X]
Post-pay mobile	[X]	[X]
Pre-pay bundles	[X]	[X]
Post-pay bundles	[X]	[X]
<i>Wholesale margins</i>		
Wholesale mobile	[X]	[X]
Openreach	[X]	[X]
<i>Mobile customers switching</i>		
Pre-pay	[X]	[X]
of which bundling	[X]	[X]
Post-pay	[X]	[X]
of which bundling	[X]	[X]
<i>Unbundling rates for which foreclosure is profitable</i>	Do not exist	<12%

Source: CMA calculations.

81. We consider it unlikely that a large proportion of Virgin Media's fixed-mobile customers would decide to switch fixed operator in response to a temporary disruption in Virgin Media's mobile services, given that:

- (a) fixed-mobile bundles are currently chosen by a small percentage of customer overall;
- (b) Virgin Media bills fixed and mobile services separately; and
- (c) Virgin Media's fixed services differ significantly from those offered by other providers, in terms of connection speeds and access to content.

82. Therefore, we consider that the merged entity would not have an incentive not to bid for a new MVNO contract with Virgin Media once the current contract expires.

Annex 1: The four mobile network operators as wholesale providers

1. This annex contains information that we used in our assessment of the wholesale mobile market, particularly in relation to our assessment of the merged entity's ability to cause harm to fixed-MVNOs.
2. Below is set out:
 - (a) a summary of comments on each of the MNOs, provided by the parties and third parties; and
 - (b) a summary of wholesale offers received by each of Sky, Virgin Media and BT at the time of their most recent tendering exercise and comments on the relative importance of various dimensions of bid quality and on how each offer differed along these dimensions.

Comments on each MNO

EE

Third party views

3. Sky submitted that [REDACTED].
4. TalkTalk submitted that [REDACTED].
5. Virgin Media told the CMA that [REDACTED].
6. In relation to its recent contract, Virgin Media provided the CMA with its assessment of the price and non-price aspects of the offers it received in 2013. From this, it appears that Virgin Media received bids from EE, [REDACTED]. Virgin Media told the CMA that it opted to remain with EE because [REDACTED].

Parties' views

7. The parties submitted that:
 - the merger must be assessed against a counterfactual in which EE does not bid for each and every MVNO contract that is put out for tender;
 - the fact that [REDACTED] did not appear to lead to those MVNOs being disadvantaged, since they secured arrangements with another MNO (ie Telefónica) [REDACTED];

- [REDACTED]. EE submitted that if it had been essential [REDACTED] in order [REDACTED]; and
 - [REDACTED].
8. BT submitted some information comparing the bids it received at the time of its own tender exercise. [REDACTED]

Telefónica

Third parties' views

9. Sky told the CMA that [REDACTED].
10. TalkTalk noted that [REDACTED]. TalkTalk noted that Telefónica had a track record of delivering successful MVNO partnerships. [REDACTED]
11. [REDACTED]

Parties' views

12. BT told the CMA that in relation to its recent contract [REDACTED].
13. The parties also submitted that Telefónica 'has a strong position in the wholesale mobile market. This is supported by the fact that Telefónica has recently won two large MVNO contracts [Sky and TalkTalk] Telefónica also hosts a number of other significant MVNOs such as Tesco Mobile and Lycamobile'.²⁰

Telefónica's submission

14. Telefónica told the CMA that, when deciding whether to bid for an MVNO contract, it took into account a number of factors, including [REDACTED].
15. Telefónica told the CMA that it [REDACTED].

Capacity constraints

16. Telefónica told the CMA that '[REDACTED], Telefónica UK believes that it could be a credible alternative to EE for Virgin Media's business. Telefónica UK believes that, in future, the [...] strategic reason to host Virgin Media as an MVNO is likely to remain'.

²⁰ BT initial submission.

17. Telefónica submitted that it [REDACTED].
18. Third parties and the parties also made submissions in relation to Telefónica's potential capacity constraints:
 - Sky told the CMA that [REDACTED].²¹
 - Virgin Media submitted that, [REDACTED].
 - The parties told the CMA that 'all the MNOs have many options to upgrade their networks and undertake denser deployment if they do not want to acquire more spectrum at the prevailing price at the [upcoming] auction'. They also submitted that 'they do not consider it credible that any MNO would fail to provision sufficient capacity such that they would be unable either to serve its existing customers, or to take any on additional customers'. They also submitted that Telefónica's behaviour in the wholesale market suggested that it would not face substantial capacity constraints – it had recently entered into full MVNO arrangements with Sky and TalkTalk.

Vodafone

Third parties' views

19. Sky told the CMA that [REDACTED].
20. Sky also told the CMA that, in relation to Vodafone:
 - [REDACTED];
 - Vodafone had been [REDACTED]; and
 - [REDACTED]
21. [REDACTED]
22. TalkTalk told the CMA that it did not perceive Vodafone as a significant competitive supplier and that it had withdrawn from the market and was attempting to engineer the withdrawal of others from the market also (within the bounds of competition law),²² [REDACTED]. [REDACTED]
23. TalkTalk also told the CMA that, in relation to Vodafone:

²¹ [Sky hearing summary](#).

²² [TalkTalk response to issues statement](#).

- [REDACTED];²³
- its actions reflected an apparent desire to engineer a tacit agreement among MNOs to withdraw service from MVNOs, particularly those seen by Vodafone as price disruptors;²⁴ and
- its incentives to offer wholesale access to MVNOs may be clouded by its own proposed move into fixed-line products.²⁵

24. [REDACTED]

25. [REDACTED]:

- [REDACTED]
- [REDACTED]
- it had indicated in public statements that incentives to offer attractive MVNO arrangements were not always clear.

26. [REDACTED]²⁶

Parties' views

27. In relation to its negotiations with Vodafone, BT told the CMA that: [REDACTED]

28. On price Vodafone's offer was [REDACTED].

29. BT also said that [REDACTED].

30. EE told the CMA [REDACTED].

Vodafone's internal documents

31. We reviewed internal documents provided by Vodafone. These indicated [REDACTED].

Vodafone's submission

32. Vodafone submitted that it strongly refuted any claims regarding a withdrawal from the market and/or that it was attempting to engineer the withdrawal of others.

²³ [ibid.](#)

²⁴ [ibid.](#)

²⁵ [ibid.](#)

²⁶ [Gamma initial submission](#) (3 July 2015), pp1–4.

33. Vodafone told the CMA that [REDACTED].
34. Vodafone told the CMA that it was [REDACTED].
35. In relation to the discussion in its internal document (explained above) of preferable MVNO customers, Vodafone submitted that [REDACTED].
36. Vodafone also told the CMA that although recent discussions [REDACTED].

H3G

Third party views

37. [REDACTED]
38. [REDACTED].²⁷ Sky also submitted that the proposed merger together with the H3G/O2 merger might lead to increased prices and/or degraded service quality for MVNOs.
39. [REDACTED]. TalkTalk considered that the H3G/O2 merger would lead it to facing a monopoly supplier of wholesale mobile services (ie Telefónica).
40. [REDACTED].²⁸ [REDACTED]
41. We also heard from Dixons Carphone. Although not a fixed-MVNO, Dixons Carphone has recently launched an MVNO brand (iD) using the H3G network. [REDACTED]. At the time of seeking a wholesale provider, Dixons Carphone [REDACTED] chose H3G because [REDACTED] in data roaming [REDACTED]. This was therefore well aligned to iD's proposition, offering consumers flexible deals and low prices for 4G, [REDACTED] Dixons Carphone also submitted that in general wholesale rate cards did not allow MVNOs to be competitive in relation to tariffs with higher data allowances or higher end-handsets.

Parties' views

42. EE submitted that the notion that H3G did not or could not compete was false and contrary to recent evidence. EE considered that H3G had always been 'in the race' and noted that H3G had recently won Dixons Carphone, which was a major player in the mobile market.
43. BT noted that [REDACTED], and also emphasised that in April 2015, H3G announced that it was launching a London-based MVNE platform to provide services to

²⁷ [REDACTED]

²⁸ [Virgin Media initial submission](#).

MVNOs both in the UK and internationally, stating that it expected to announce partnerships with a number of MVNOs in the coming months.^{29,30} [REDACTED].³¹ [REDACTED].³²

H3G's submission

44. H3G reported that it recently received [REDACTED] hosting tenders from prospective MVNO customers. H3G submitted bids on [REDACTED] of these tenders and won [REDACTED]. [REDACTED]. With respect to TalkTalk's 2014 tender, H3G [REDACTED].³³ [REDACTED]

Capacity constraints

45. H3G also submitted that, in relation to capacity, it remained [REDACTED] relative to its competitors. H3G submitted that its network carried [REDACTED]% of all data traffic in the UK on just 12% of the spectrum, and that it was [REDACTED]. H3G submitted analysis that showed the level of congestion that it forecasted, on the basis of spectrum it already owned, including the 1.4 GHz spectrum it recently purchased, planned investments, [REDACTED]. This evidence is explained in detail in Appendix G.

Wholesale offers received

46. Virgin Media last carried out a tendering exercise in 2012/13; BT did so in 2013/14 and Sky did so in 2014; TalkTalk did so in 2014. [REDACTED]. We asked each of the other operators for information to help us compare the price and non-price aspects of the bids they received, including:
- (a) internal documents in which they assessed the offers received; and
 - (b) comments on the relative importance of various dimensions of bid quality and on how each offer differed along these dimensions.

Pricing aspects

Headline pricing assessments

47. Table 1 shows the headline assessment that each MVNO made of the costs of the bids they received, as shown in their internal documents. These show

²⁹ See for example [Hutchinson Whampoa Limited's website](#).

³⁰ BT [response to issues statement](#).

³¹ [BT initial submission](#).

³² [ibid](#).

³³ TalkTalk ultimately switched from Vodafone to O2.

that the gap between the price of the chosen and next placed bid was 5% or under in all three cases.

Table 1: Bids received by Sky, BT, and Virgin Media

		<i>£m</i>			
	<i>Expected costs assessed over</i>	<i>Telefónica</i>	<i>Vodafone</i>	<i>EE</i>	<i>H3G</i>
Virgin (2012/13)	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
Compared to chosen (EE)		[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
BT (2013/14)	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
Compared to chosen (EE)		[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
Sky ([REDACTED])	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
Compared to chosen (Telefónica)		[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]

Source: MVNOs.

*This reflects the final price from EE. At the stage when Vodafone and Telefónica were dropped, EE's offer was [REDACTED].

Other pricing assessments

48. The information provided by the MVNOs also showed consideration of the components and structure of the price offered. For example, BT's internal document showed that the unit prices offered by Telefónica were [REDACTED].
49. Virgin Media, in internal documents assessing the offers received, noted for example that:
 - (a) [REDACTED]
 - (b) [REDACTED]
 - (c) [REDACTED]
50. In an internal document assessing the offers received, Sky noted: [REDACTED]
51. In subsequent submissions, Sky told the CMA [REDACTED].
52. Sky provided [REDACTED].

Non-price factors

53. The operators also took into account non-price factors when making their choice of MNO.

Virgin Media's assessment of non-price factors

54. The internal documents provided by Virgin Media showed that the key non-price factor differentiating the offers it received were [REDACTED]. It noted, for example that [REDACTED].
55. In response to questions from the CMA Virgin Media submitted that [REDACTED]:

(a) [REDACTED]

(b) [REDACTED]

(c) [REDACTED]

(d) [REDACTED]

BT's assessment of non-price factors

56. An internal document provided by BT showed that [REDACTED]. BT told the CMA that in relation to its recent contract [REDACTED].

Sky's assessment of non-price factors

57. Sky submitted that 'Given the bespoke nature of individual MVNO deals and the broad range of structure, no one deal with a major MVNO is likely to be the same. As such, like-for-like comparisons are extremely difficult', and that it 'considered its MVNO offers across a range of sensitivities and parameters – both in relation to the overall charging structure and non-price terms – before making its final decision'.³⁴

58. An internal document provided by Sky [REDACTED].

Table 2: Comparison of bids received by Sky

[REDACTED]

Source: Sky.

Table 3: Comparison of bids received by Sky - detail on termination rights

[REDACTED]

Source: Sky.

³⁴ [Sky response to provisional findings.](#)

Wholesale mobile: partial foreclosure analysis

Overview

1. This appendix presents evidence relevant to the possibility of partial foreclosure of Virgin Media under its current MVNO contract with EE, and should be read in conjunction with Chapter 13. It focuses on three areas:
 - (a) Hindering Virgin Media's transition to a full MVNO.
 - (b) Hindering the launch of 4G services.
 - (c) Degradation of service/lack of cooperation.
2. The parties argued that they would possess no ability to partially foreclose Virgin Media post-merger with respect to either the pricing or quality of wholesale mobile services based on their interpretation of the terms and conditions contained in the current agreement.

Background: Virgin Media's contract with EE and transition to full MVNO

3. [✂]
4. [✂]

Hindering Virgin Media's transition to a full MVNO

5. Virgin Media alleged that the merged entity would have the ability and incentive to delay its transition to a full MVNO architecture. It may be difficult for light MVNOs to migrate to a full MVNO model, as this requires the cooperation of the existing MNO host in addition to the skills to manage the network aspects of operating as a full MVNO.
6. Virgin Media said that, in addition to the longer term benefits of being a full MVNO, it would likely face higher costs and greater risks in moving to an alternative MNO host as a light MVNO relative to a full MVNO. [✂]

Virgin Media's views

7. According to Virgin Media, EE (and the merged entity) could delay [✂] Virgin Media's transition to full MVNO [✂]:
 - (a) [✂] The agreement includes a process for resolving disputes. [✂]

- (b) The agreement specifically states that EE could [REDACTED]. Virgin Media [REDACTED]. Moreover, [REDACTED]
 - (c) The delay has scope to cause considerable harm to Virgin Media, since [REDACTED]
8. Virgin Media also alleged that EE may already be prioritising other projects [REDACTED]:
- (a) Virgin Media alleged that, [REDACTED]
 - (b) According to Virgin Media, EE [REDACTED]¹[REDACTED]. As such, Virgin Media was uncertain as to [REDACTED] how much resource would be available.
9. Virgin Media has provided estimates of [REDACTED]
10. Under a scenario based on MTP completing in [REDACTED], Virgin Media estimates that [REDACTED]² [REDACTED]³ [REDACTED]
11. Virgin Media said that [REDACTED]
12. Virgin Media therefore remains concerned that, post-Transaction, [REDACTED]

The parties' views

13. The parties argued that [REDACTED].⁴ According to the parties, any delay that Virgin Media had experienced to date in its desired transition to a full MVNO arrangement had been entirely the responsibility of Virgin Media. For example, the parties argued that [REDACTED]⁵
14. An EE internal document from March 2015 (before our investigation of this issue) noted that [REDACTED]
15. EE told us that [REDACTED]
16. Moreover, the parties pointed out that [REDACTED]⁶
17. The parties also submitted that they would possess no pre- or post-merger incentive to delay Virgin Media's transition to a full MVNO model. Specifically, the parties argued that:

¹ [REDACTED]

² [REDACTED]

³ [REDACTED]

⁴ [BT/EE response to issues statement](#), paragraph 8.9.

⁵ *ibid*, p. 27, paragraph 8.7.

⁶ [BT/EE response to issues statement](#), p28, paragraph 8.11(b).

(a) [REDACTED];⁷ and

(b) [REDACTED].⁸

18. EE said that, [REDACTED]

Issues arising from transition to full MVNO

19. It may be difficult for light MVNOs to migrate to a full MVNO model, as this requires the cooperation of the existing MNO host in addition to the skills to manage the network aspects of operating as a full MVNO.

20. We note the diametrically opposing views of the parties and Virgin Media regarding the history of the latter's desired transition to a full MVNO model. Based on the detailed information available to us, summarised above, it is difficult to ascertain to what extent EE may have hindered Virgin Media's transition to full MVNO, since [REDACTED]. Both this and Virgin Media's contention that [REDACTED] (discussed below) illustrate that firms may enter into contracts that do not turn out to be favourable ex post, and that it is not possible to cover every eventuality with contractual terms. We note that these issues have arisen pre-merger and so are not merger-specific. However, they do suggest that contracting firms may find themselves in situations where they are dependent on goodwill or 'reasonable endeavours', and therefore that EE may have some ability to foreclose Virgin Media within contract.

21. [REDACTED], we consider that this provides Virgin Media with some protection, and therefore limits the harm that EE can inflict.

22. We also considered the effect on Virgin Media of [REDACTED]. We understand that there are three possible scenarios:

(a) [REDACTED]

(b) [REDACTED]

(c) [REDACTED].

23. We understand that all such transitions are risky (and have occurred rarely in the UK). The two main areas of risk are around customer churn during a SIM swap (because the operator does not have current address details for the customer, or the customer does not follow instructions, or the customer's phone is locked to a network, or the customer finds that coverage is bad

⁷ *ibid*, p32, paragraph 8.20(a).

⁸ *ibid*, paragraph 8.20(b).

under the new network); and billing system handover. All of the above options include a SIM swap and a billing handover. In addition, there are various limits on the number of customers that can be transferred at one time (eg because of the need to port existing numbers).

24. We understand that [REDACTED]
25. We understand that with sufficient time to plan and put arrangements in place with a new network host, the effect of failing to complete MTP might be limited. The worst case for Virgin Media would be [REDACTED].
26. [REDACTED]^{9, 10}
27. Using Virgin Media's estimates, [REDACTED]¹¹ and [REDACTED]¹² We would expect these to be [REDACTED].

Hindering the launch of 4G services

Virgin Media's views

28. Virgin Media claimed that EE was hindering its launch of 4G services, in two ways, without breaching their contract:
 - (a) [REDACTED]
 - (b) Virgin Media claimed that it is necessary to have access to 4G on wholesale rates that would enable it to launch a commercially viable retail service, saying that: [REDACTED].¹³
29. Virgin Media said that the ability to offer attractive 4G services was an imperative for its mobile business to be able to compete effectively, and their absence affected Virgin Media's retail propositions and customer churn:
 - (a) Across the mobile customer base, approximately [REDACTED]% of all network related complaints were related to an absence of 4G.
 - (b) Virgin Media estimated it lost [REDACTED] mobile customers per month due to the lack of 4G, with those numbers set to increase significantly in the coming years given the roll out of 4G by other operators.

⁹ [REDACTED]

¹⁰ [REDACTED]

¹¹ See footnote 2.

¹² [REDACTED]

¹³ [REDACTED]

(c) Virgin Media reported that it was [REDACTED]

30. Virgin Media said that the merged entity would have reduced incentives to enable the provision of 4G services, because post-merger BT/EE would seek to protect the merged entity's leading position in 4G given the aggregation in high-frequency spectrum holdings.

The parties' views

31. The parties said that it was in EE's interests to support Virgin Media's launch of 4G, because: [REDACTED].
32. EE said that [REDACTED]
33. EE told us that [REDACTED]
34. [REDACTED]
35. The parties concluded that [REDACTED]

Evidence relating to the launch of a 4G service

36. As with Virgin Media's transition to full MVNO, this is an issue where the parties and Virgin Media have very different views as to whether and to what extent EE is hindering Virgin Media.
37. We compared Virgin Media's 4G wholesale data rates with those negotiated by other MVNOs. They appear to be [REDACTED]. Therefore, while Virgin Media may consider that its rates do not permit a 'commercial' 4G offering, other MVNOs may take a different view.
38. On speed, we have not determined why [REDACTED]. Virgin Media may consider that these leave it unable to compete on level terms with EE for consumers who desire high speeds. However, we have found no evidence that the precise speed is more important than being able to offer a service labelled as '4G'. Even if this is the case, we have not seen evidence that Virgin Media would not be able to compete with operators on other networks.
39. Internal documents we have reviewed are consistent with EE having the incentive to retain Virgin Media pre-merger. However, [REDACTED].
40. However, we were not able to find similar evidence on EE's incentive to renegotiate 4G rates or speed limits pre-merger.

Degradation of service/lack of cooperation

Virgin Media's views

41. According to Virgin Media, there are several different ways in which the merged entity could harm it [REDACTED]. For example:
- (a) [REDACTED]
 - (b) [REDACTED]
42. Virgin Media gave us several examples of ways in which it believed it had already suffered under its contract with EE.
43. First, Virgin Media said [REDACTED]. For example:
- (a) [REDACTED]
 - (b) [REDACTED]
44. Second, Virgin Media said that [REDACTED]. For example:
- (a) [REDACTED]
 - (b) [REDACTED]
45. Third, EE had in the past [REDACTED].

The parties' views

46. The parties told us that:
- (a) The agreement stipulates the charges paid by Virgin Media over the duration of the contract as well as the services Virgin Media has access to [REDACTED] and EE cannot unilaterally change these terms.¹⁴ Moreover, [REDACTED].
 - (b) EE said that the contract required it to meet various service level obligations and to report compliance with these service levels.¹⁵ Furthermore [REDACTED].^{16,17}

¹⁴ [BT/EE response to issues statement](#), p23, paragraph 8.2(a).

¹⁵ *ibid*, paragraph 8.4(d).

¹⁶ *ibid*, pp25–26, paragraph 8.4(e).

¹⁷ *ibid*, pp25–26, paragraph 8.4(e).

(c) Virgin Media could readily detect any degradation in service levels via the independent mobile analytics firms that provide service reports.¹⁸

(d) [REDACTED]¹⁹

(e) [REDACTED]²⁰

(f) The agreement allows Virgin Media to terminate the contract in the event [REDACTED].²¹

47. With regard to degrading the quality of wholesale mobile service provided to Virgin Media, the parties submitted that if the merged entity were to do so:

(a) Virgin Media would likely move to an alternative MVNO host in response when the agreement expired [REDACTED], ie Virgin Media had significant countervailing buyer power that was not dependent on [REDACTED].²² This would not be in the merged firm's interest since it had strong incentives to retail Virgin Media as a wholesale customer, because:

(i) Virgin Media accounted for a significant proportion of EE's wholesale mobile revenues (approximately [REDACTED]% in 2014);²³ and

(ii) the estimated value of the agreement to the merged firm was [REDACTED].²⁴

(b) There was no evidence that degradation of service would lead to Virgin Media's customers switching to alternative (fixed-mobile or other) providers. This was because:

(i) only [REDACTED] of Virgin Media's retail customers took both fixed and mobile services from Virgin Media;²⁵

(ii) Virgin Media's fixed services were clearly differentiated from BT's (especially in regard to Virgin Media's faster broadband offerings);²⁶

¹⁸ *ibid*, p26, paragraph 8.4(f).

¹⁹ *ibid*, p25, paragraph 8.4(c).

²⁰ *ibid*, p25, paragraph 8.4(c).

²¹ *ibid*, paragraph 8.4(g).

²² *ibid*, p28, paragraph 8.12(a); p29, paragraphs 8.13–8.16.

²³ *ibid*, p29, paragraph 8.14.

²⁴ *ibid*, p29, paragraph 8.14.

²⁵ *ibid*, p30, paragraph 8.18(a).

²⁶ *ibid*, paragraph 8.18(b).

- (iii) the most likely outcome of quality degradation would be for Virgin Media's fixed-mobile customers to continue taking fixed services from Virgin Media while taking mobile services from another MVNO;²⁷ and
- (iv) survey data indicated that [redacted]% of Virgin Media's broadband subscribers that switched to another broadband provider did not choose BT; moreover, [redacted].²⁸

²⁷ [ibid](#), p31, paragraph 8.18(c). The Parties rationalised this argument on the basis that Virgin Media's fixed-mobile customers must currently subscribe to two separate contracts, one for the fixed services component and the other as a SIM-only add-on contract for mobile services. [ibid](#), paragraph 8.18(d).

²⁸ [ibid](#), paragraph 8.18(e).

Mobile backhaul: Input foreclosure

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Background

1. This section provides a short overview on mobile backhaul, considering in turn:
 - (a) what mobile backhaul is and the different technologies used for backhaul connectivity; particular attention is paid to fibre Ethernet backhaul, which is often the most efficient technology for carrying large amounts of data;
 - (b) the regulatory framework that applies to fibre Ethernet backhaul; and
 - (c) the contracts currently in place between MNOs and backhaul providers.

Types of mobile backhaul

2. Mobile backhaul is the network connectivity between MNOs' radio base stations and their core network. Mobile backhaul usually includes a local end from the base station site back to a local exchange and additional connectivity from a local exchange to a point of connection (POC) with the MNOs' core network. In some cases, the traffic from multiple radio station sites is aggregated at one site (a hub) before being transported to the core network.
3. There are currently four main methods of supplying mobile backhaul links:
 - (a) Copper: the available average bandwidth for copper is limited to few multiples of 2 Mb/s (depending on how much copper is used). This is not sufficient for 4G data requirements; as mobile sites are upgraded to 4G, copper-based backhaul links are being replaced.¹

¹ [Vodafone initial submission](#), paragraph 2.15(i).

- (b) Microwave: this technology is widely used by MNOs. Although this can be an effective solution, its deployment is limited by a number of factors, including:
- (i) Bandwidth: microwave suffers from fluctuations in bandwidth availability due to atmospheric conditions. Although a microwave link can, in theory, achieve a relatively high bit rate in peak conditions, significant losses will occur in poor weather and, in some cases, the signal may be so poor that no throughput is possible. This means that, in practice, microwave links are planned on the basis that they will achieve less than half of their theoretical throughput and well under 1 Gbit/s.²
 - (ii) Spectrum availability: MNOs often have to use Ofcom-administered spectrum. This spectrum is distributed on a first-come first-served basis. Lower frequency spectrum (which travels further) is generally less available than higher frequency spectrum and there is no visibility of spectrum availability in particular geographic locations until the application for spectrum is submitted to Ofcom. Vodafone told us that this did not provide a secure way of planning and building networks.³ On the other hand, in BT's experience, availability of spectrum for microwave use from Ofcom was not a material issue.
 - (iii) Line of sight: microwave links require line of sight between the antennas at each end, making areas with certain features (eg tall buildings, hills) unsuited to microwave backhaul.
 - (iv) Distance and multiple 'hops': although using a higher frequency of spectrum for backhaul will accommodate higher throughput, the distance the signal can travel will be shorter. Spectrum scarcity in lower frequency bands often requires MNOs to use higher frequencies and thus increases costs due to the need for re-transmitting and amplifying the signal with additional equipment along the route (a process known as 'hopping'). Signal degradation limits the number of 'hops' that can be used.
- (c) E-band: this microwave technology is newly available on the market and can achieve bandwidths up to 2 Gbit/s using the 60–100 GHz spectrum bands. However, E-band cannot be used for backhaul in many areas for a number of reasons:

² *ibid.*, paragraph 2.15 (ii).

³ *ibid.*

- (i) Propagation: E-band can propagate signals up to 3km (compared with traditional microwave of up to 12km); this is a particular limitation in rural areas.
 - (ii) Line of sight: E-band, along with other microwave technology, requires line of sight between the two antennas.
 - (iii) Environmental factors: the wavelength technology underpinning E-band requires extremely sturdy masts as signal loss can occur when the antennas move in windy conditions. Masts or rooftop towers are therefore the only locations which are sufficiently stable to support the antennas without resulting in loss to the signal in windy conditions.⁴
- (d) Fibre: optic-fibre-based backhaul is the most effective backhaul choice, with few distance limitations. It is robust, requires little ongoing maintenance and can be used to provide any bandwidth, making it particularly suitable for 4G. The main disadvantage is that the fibre needs to be physically connected to the base stations, requiring it to either be buried underground or carried overhead on poles. As a result, new roll out is costly, especially into remote areas.

4. Fibre mobile backhaul can be based on different transmission technologies.

- (a) Synchronous digital hierarchy (SDH) standard.⁵ SDH links on fibre usually carry traffic at 155 Mbit/s bandwidth. Although MNOs still use these links in many of their sites, SDH is a legacy technology, which is quickly being replaced as MNOs upgrade their backhaul links to higher bandwidths. For example, [X], indicated that most of its circuits will be decommissioned by the end of 2018. [X], and EE/MBNL's roll-out of fibre [X] also means that it has [X] legacy circuits remaining.
- (b) Mobile Ethernet backhaul.⁶ Ethernet is a more cost-effective technology for high bandwidth backhaul links. MNOs are rapidly adopting this technology for linking their radio sites to their core network. The bandwidths currently adopted are of 100 Mbit/s or 1 Gbit/s, although increasing mobile data traffic may require the adoption of higher bandwidths (10 Gbit/s) in the next few years. According to EE, H3G and MBNL, currently major urban sites are being served with [X] connections which are likely to be

⁴ Vodafone initial submission, paragraph 2.15 (iii).

⁵ Ofcom, in its 2013 Business Connectivity Market Review (2013 BCMR), uses the expression 'RBS backhaul' specifically to refer to mobile backhaul provided over SDH links.

⁶ We also include in this category leased lines using wavelength-division multiplex (WDM) technology, which allows a single fibre to carry multiple services simultaneously. WDM needs to be provided with a relevant transport protocol which, if the technology were used for mobile backhaul, would be Ethernet.

upgraded to [x] within [x]. MBNL indicated that it expected to move its remaining [x] mobile sites currently on [x] to [x] speeds over [x].

Regulatory framework

5. Ofcom reviews competition in some communications markets every three years in accordance with the EU regulatory framework, which is implemented in the UK by the Communications Act 2003. The market review process involves three analytical stages. First, Ofcom defines each relevant market in terms of its product and geographic scope. It then assesses whether any CP has a position of significant market power (SMP) (broadly equivalent to dominance) in any of the relevant markets. Finally, where SMP is found, Ofcom imposes regulatory conditions (known as ‘SMP conditions’) on the CP concerned to address the competition concerns arising from such SMP.⁷ In the context of mobile backhaul, the most relevant such review is the Business Connectivity Market Review (BCMR), last concluded in March 2013, and due to be concluded again in March 2016. The BCMR considers a range of telecommunications products that are used primarily for business purposes (leased lines), including mobile backhaul.
6. In addition to the market review process, the Undertakings given by BT are also relevant. These are legally binding Undertakings given by BT to Ofcom in 2005 following Ofcom’s strategic review of the telecommunications sector. They were given under the Act, in lieu of a market investigation reference to the Competition Commission. They impose the functional separation of Openreach from the rest of the BT Group. The Undertakings also require Openreach to provide its products and services on an EOI basis.
7. The Undertakings require that, for the development of new products, Openreach follow a formal SoR process. All requests for the development of new products, irrespective of whether they come from other BT divisions or from non-BT CPs, are submitted to Openreach through the same SoR process and are open to scrutiny from other CPs. Openreach’s decision on the implementation of a product request is based on considerations of its commercial and technical viability, where commercial returns are assessed only in relation to Openreach, without consideration of the impact on the rest of BT Group.⁸
8. The Undertakings included the creation of the Equality of Access Board (EAB), which monitors BT’s compliance with the Undertakings, reports on progress to Ofcom and the industry and offers advice to BT on its compliance

⁷ [Ofcom response to issues statement](#), paragraph 2.5.

⁸ See [EAB Annual Report 2014](#), p16.

with the Undertakings. The EAB also conducts investigations of breaches and complaints reported to it by BT and those found by the Equality of Access Office (EAO), as well as complaints received from CPs via its formal complaints process. The Undertakings require that the EAB has five members: three independent members, one BT Group plc non-executive director and one BT senior manager.

9. As the main focus of our analysis will be on fibre Ethernet backhaul, this section summarises the main features of Ofcom's regulation of Ethernet leased lines. We first present the current regulation, as established in the 2013 BCMR; we then highlight the main changes proposed by Ofcom in its recent consultation for the 2016 BCMR.

The 2013 BCMR

10. In the 2013 BCMR Ofcom concluded that Ethernet leased lines used as components of managed backhaul services supplied to MNOs should form part of the broader leased lines markets. Ethernet leased lines up to 1 Gbit/s were included in the Alternative Interface (AI) market, while lines with higher bandwidth (or using wavelength-division multiplexing (WDM) technology) were included in the Multiple Interface (MI) market.⁹ BT was found to have SMP in the AI market in the whole of the UK, except the Hull area (where BT is not present); and in the MI market, except in the Hull area, and the West East and Central London Area (WECLA), where Ofcom considered there was a sufficient level of competition.^{10,11}
11. Ofcom imposed a number of remedies on BT in order to address the competition problems it identified in the SMP assessment. The most relevant in the context of the present merger can be summarised as follows:
 - (a) Requirement to provide network access:¹² BT must provide wholesale access to its network for these services to any CP making a reasonable request for access.
 - (b) Requirement to provide network access on equivalence of inputs (EOI) basis:¹³ when providing access BT must provide the same products and services to all customers (including its own downstream divisions) on the same terms, which means:

⁹ Ofcom [2013 BCMR](#), paragraphs 1.16 & 1.17.

¹⁰ *ibid*, paragraph 1.25.

¹¹ The backhaul products included in these markets are supplied by Openreach. However, Ofcom's SMP finding relates to BT Group and the remedies are imposed on BT.

¹² Ofcom [2013 BCMR](#), paragraphs 12.272 & 13.214.

¹³ *ibid*, paragraphs 12.293 & 13.230.

- (i) at the same prices;
- (ii) using the same processes; and
- (iii) to the same timescales.

BT may provide different service levels at different prices and Service Level Guarantees, but the availability of these must be the same for all CPs.

- (c) Requirement not to discriminate unduly: BT must not unduly discriminate against any particular CP.¹⁴
- (d) Charge control:¹⁵ Ofcom controls the level of charges that BT can set for its wholesale products. The charge control takes an RPI-X approach. In general, several services are grouped in baskets and a charge cap is imposed on the entire basket. BT has some flexibility in setting the prices of the individual products within a basket, although further caps are imposed on sub-baskets and on individual products. For a more detailed description of the charge control regulation, see paragraph 110.

12. In the BCMR 2013 Ofcom did not undertake a detailed consideration of downstream managed backhaul services, considering that the upstream regulation of Openreach products would be a sufficient constraint on BT Wholesale's provision of these services.¹⁶

The consultation on the 2016 BCMR

13. In May 2015, Ofcom published a consultation document outlining the proposed changes to the current regulatory framework to be implemented with the 2016 BCMR. The main differences with respect to the current regulation involve:
- (a) a deregulation in central London;¹⁷
 - (b) the introduction of regulated access to BT's dark fibre;¹⁸ and

¹⁴ *ibid*, paragraphs 12.293, 12.302, 13.230 & 13.234.

¹⁵ *ibid*, paragraphs 17.29, 18.8 & 18.23.

¹⁶ *ibid*, paragraphs 4.396 & 4.397.

¹⁷ Ofcom consultation document on the 2016 BCMR from May 2015 ([BCMR May 2015 consultation](#)), paragraph 1.20.

¹⁸ *ibid*, paragraph 1.27.

(c) a stricter regulation of the quality of service to be guaranteed by Openreach.¹⁹

14. Ofcom is still consulting on these proposals, and there is a degree of uncertainty on whether they will be implemented at all and, if so, in what form.
15. In the consultation document, Ofcom defines a new Contemporary Interface (CI) market, which includes the AI and MI markets defined in the 2013 BCMR. The WECLA is divided into two areas: the Central London Area (CLA) and the London Periphery (LP). Ofcom provisionally finds that BT has SMP everywhere in the UK, except for the Hull area, where BT is not present, and the CLA, where Ofcom considers there is sufficiently strong competition.²⁰
16. The main innovation with respect to the 2013 BCMR is the proposal of passive remedies, that is, of an obligation for BT to provide access to dark fibre at regulated terms in the areas where it has SMP in the CI market. BT would be required to provide dark fibre terminating segments; in practice, dark fibre could be used to substitute for EAD LA or EAD. Ofcom proposes that dark fibre be priced following an 'active-minus' approach: the price of a dark fibre circuit would be set at the price of the corresponding 1 Gbit/s active product (EAD LA or EAD), minus the long-run incremental cost (LRIC) of its active elements. Ofcom envisages that dark fibre would be made available by BT within one year of the approval of the new regulation.²¹
17. In its consultation document, Ofcom has observed a quality degradation of the service Openreach provides to all CPs (including the other BT divisions), especially in relation to its provisioning performance: the time between when a customer places an order for an Openreach Ethernet product and when this is installed and connected has significantly increased since 2011.²² Ofcom considers that Openreach does not currently have sufficient incentives to improve its quality of service; therefore, Ofcom proposes to impose stricter minimum quality of service standards and to require BT to provide specified quality of service key performance indicators (KPIs).

How MNOs currently source mobile backhaul

18. For each MNO, Table 1 below shows how mobile backhaul is sourced, distinguishing between different backhaul technologies. The data is expressed in terms of number of circuits.

¹⁹ *ibid*, paragraph 1.41.

²⁰ *ibid*, Table 1.2.

²¹ *ibid*, Table 9.1.

²² *ibid*, paragraph 1.38.

Table 1: Backhaul circuits currently used by MNOs (June 2015)

Technology and supplier	MBNL*	EE (unilateral)	Telefónica	Vodafone
Microwaves				
Self-supply	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
Other	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
Copper	[REDACTED]	[REDACTED]	‡	[REDACTED]
Fibre				
Legacy	[REDACTED]	[REDACTED]	‡	[REDACTED]**
Ethernet:				
Openreach	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
BT Wholesale	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
Virgin Media	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
Other	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
Self-supply	[REDACTED]†	[REDACTED]	[REDACTED]	[REDACTED]

Source: [REDACTED]; [REDACTED]; [REDACTED].

*[REDACTED]

†'Tie-cable' circuits, where a cell site is co-located at an MBNL switch site.

‡[REDACTED]

**[REDACTED]

19. Table 2 gives an overview of the costs of backhaul for each MNO, split by major providers.

Table 2: Backhaul expenditure in 2014 by MNOs

Supplier	EE	H3G	Telefónica	Vodafone
£				
Opex				
Openreach	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
BT Wholesale	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
Virgin Media	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
Others/self-supply	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
Capex				
Openreach	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
BT Wholesale	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
Virgin Media	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
Others/self-supply	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
Total	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]

Source: [REDACTED]; [REDACTED]; [REDACTED]; [REDACTED].

20. In the remainder of this section, we present more information about the contractual arrangements of each MNO in relation to mobile fibre Ethernet backhaul.

MBNL (EE/H3G)

21. H3G, EE and MBNL signed a Master Services Agreement (MSA) with BT Wholesale in [REDACTED]. The MSA was for the supply of [REDACTED].
22. As a result, the MSA with BT Wholesale will terminate on [REDACTED].

23. [REDACTED].²³
24. MBNL entered into an agreement with Virgin Media in August 2011. [REDACTED]
25. [REDACTED].²⁴
26. Finally, MBNL is now in commercial discussions with a small number of dark fibre providers (including CityFibre and [REDACTED]) who are planning to deploy fibre networks in cities and mid-sized towns across the UK. A first project is under way in Hull, where CityFibre will provide dark fibre to connect [REDACTED] MBNL sites.

Telefónica

27. While MBNL contracts with BT Wholesale and Virgin Media for the provision of the entire backhaul connection between base stations and EE's and H3G's core networks, [REDACTED]:
 - (a) [REDACTED]
 - (b) [REDACTED]
28. [REDACTED]

Vodafone

29. As can be seen in Table 1, [REDACTED].
30. [REDACTED] Vodafone signed a long-term contract with BT Wholesale, [REDACTED].
31. [REDACTED]
32. [REDACTED]
33. [REDACTED]
34. [REDACTED]

²³ [REDACTED]

²⁴ [REDACTED]

Market definition

Product market definition

35. In order to appropriately define the markets we considered the following issues:
- (a) Whether other backhaul mediums (copper, microwaves) are sufficiently close substitutes for fibre backhaul, and whether Ethernet and other transmission technologies should be included in the same market.
 - (b) Whether end-to-end managed backhaul services and unmanaged fibre backhaul constitute separate markets.
 - (c) Whether markets should be defined with specific reference to mobile backhaul, or whether backhaul products sold to other CPs should be included.
 - (d) Whether, among leased lines, there are separate markets for the terminating and trunk segments.
 - (e) Whether dark fibre constitutes a separate market.
 - (f) Whether markets can be segmented by the capacity of backhaul circuits.

Substitutability between backhaul mediums and transmission technologies

36. Third parties have expressed concerns only in relation to fibre Ethernet backhaul. However, the relevant markets may be larger, including the provision of backhaul services through different mediums (copper or microwaves) and different transmission technologies (such as SDH). Whether this is the case depends on how closely substitutable different mediums and technologies are in addressing the particular backhaul requirements that MNOs currently fulfil using fibre Ethernet circuits.

Fibre and copper backhaul

37. Given the past and predicted increase in mobile data traffic, the capacity limitations of copper make it unsuitable to the backhaul needs of MNOs. As seen in paragraph 4, MNOs are quickly replacing copper backhaul circuits with fibre and microwave ones. MNOs are currently upgrading many of their backhaul circuits to a capacity of 1 Gbit/s and expect to need higher capacities (up to 10 Gbit/s) in the near future; as seen in paragraph 3(a), these capacity levels cannot be obtained with copper circuits. Therefore, we are of the view that copper backhaul is not a close substitute for fibre

backhaul and should not be included in the relevant markets for the purpose of this theory of harm.

Fibre and microwave backhaul

38. The Parties strongly argued that there was a high degree of substitution between fibre and microwave backhaul. An internal document from BT also shows that [REDACTED]. The Parties recognised that microwave backhaul was not suitable to all mobile base stations, but said it was available across a majority of locations.²⁵
39. On the other hand, some third parties insisted that microwave was not in many cases a valid substitute for fibre. Vodafone commissioned a report from Analysys Mason on the suitability of microwave backhaul for 4G.²⁶ The report recognised that microwave backhaul, and in particular E-band in urban areas, was in theory capable of reaching the capacity levels MNOs required. However, the availability of spectrum in the appropriate bands and, especially for small cells, the difficulty of getting line of sight imply that, in practice, microwave would not be a valid alternative for a large number of sites.
40. It is undeniable that microwave backhaul is used and will continue to be used by MNOs and that, in some situations, microwave is preferable to fibre because of its lower cost. This, however, does not imply by itself that microwave backhaul constitutes a competitive constraint to fibre backhaul supplied by BT. For this to be the case, there must exist a sufficiently large number of sites in which, at the current price levels, microwave and fibre backhaul are sufficiently close substitutes that a relatively small change in the price of fibre backhaul would lead to it being substituted by MNOs with microwave links to such an extent that the price rise is unprofitable.
41. Internal documents from EE provide some evidence for us to consider whether the above is the case. [REDACTED]. We note that MBNL already uses microwave backhaul in approximately [REDACTED]% of its sites. [REDACTED]
42. Further evidence can be obtained from the Topology Planning Guidelines for the MBNL Mobile Backhaul Network, which specify the general principles governing the choice between fibre and microwave backhaul. [REDACTED]
43. There might be more scope for substituting fibre with microwave backhaul in the case of [REDACTED].

²⁵ BT initial submission, paragraph 2.8.

²⁶ Analysys Mason, *Mobile Backhaul Market: Phase 1 Report* (February 2014).

44. The limitations of microwaves compared with fibre were recognised by Ofcom in its BCMR May 2015 consultation, where it stated that:

Although microwave links are used for mobile backhaul needs, they cannot meet MNOs' backhaul requirements in all cases and therefore, technically, microwave could not act as substitutes for mobile backhaul products under all scenarios. We have previously identified a number of issues with microwave backhaul:

- ability to support only lower capacity links compared to fibre-based backhaul;
- requirement for line of sight connectivity;
- significantly lower transmission range than fibre-based backhaul links;
- deployed microwave antennas are exposed and have higher risk of failure.²⁷

45. Ofcom concluded that 'given 4G / LTE network deployments and continuing growth in data demand are driving significant increases in required backhaul capacity, the limitations to microwave technology make fibre the preferred and potentially the only viable technology choice for many backhaul applications.' Ofcom also noted that MNOs were planning 'to reduce the extent of fixed wireless usage for backhaul applications and to rely increasingly on fibre deployments which can be more easily scaled to meet increasing bandwidth requirements.'²⁸

46. Our view is, therefore, that microwave backhaul may not be a sufficiently close substitute to fibre backhaul and, as such, should not be included in the same market as fibre backhaul. However, in the context of our competitive assessment, we will take into account any competitive constraint that microwave backhaul can exert on the suppliers of fibre backhaul.

Fibre Ethernet and legacy technologies

47. Finally, although, as seen in paragraph 4, different transmission technologies can be adopted with fibre backhaul, our view is that SDH links should not be included in the same market as Ethernet links. SDH is a legacy technology, which MNOs are replacing with Ethernet. Ethernet is a more efficient

²⁷ BCMR May 2015 consultation, paragraph A11.54.

²⁸ *ibid*, paragraph A11.56.

technology for the transmission of high volumes of data. This is reflected by the different pricing of Ethernet and legacy technologies; as noted by Ofcom, at the high bandwidth required by MNOs, the price of these legacy links (which Ofcom includes in the Traditional Interface (TI) market) is much higher than the price of Ethernet links.²⁹ Moreover, Ethernet no longer suffers from the issues that limited its adoption in mobile backhaul in the past, such as the absence of synchronisation.³⁰ Ofcom also notes that ‘medium and high bandwidth TI prices will not constrain Ethernet prices as Ethernet customers are unlikely to move back to legacy services, particularly at higher bandwidths where there is a significant price premium associated with TI services.’³¹

48. Therefore, our view is that the relevant upstream product markets should include only the provision of fibre Ethernet circuits.

Substitutability between managed fibre mobile backhaul and unmanaged leased lines

49. The theory of harm outlined above relates to the potential foreclosure by the merged entity of terminating segments leased lined (supplied by Openreach) and end-to-end managed backhaul services (provided by BT Wholesale). We therefore need to assess whether these two different categories of products are part of a single market or of two different markets. Our assessment will be based on demand-side considerations, taking the MNOs as the relevant customer base.
50. As seen in Chapter 15, paragraph [13], MNOs can source backhaul by either leasing (or deploying) the terminating and trunk segments separately, or by purchasing a managed service providing end-to-end connections. Disaggregated terminating segments are provided mainly by Openreach and Virgin Media, except in some urban areas where alternative dark fibre providers are available. The provision of trunk segments, on the other hand, appears to be more competitive. Unlike terminating segments, Ofcom has seen no need to regulate trunk. The main providers of managed end-to-end backhaul services are BT Wholesale and Virgin Media.
51. Compared with managed services, using disaggregated terminating and trunk segments is more complex and costly for MNOs. For example, if an MNO wanted to purchase terminating and trunk connections from Openreach and BT Wholesale respectively, it would need to have its own equipment at the

²⁹ *ibid*, Figure A10.2.

³⁰ Mobile operators have to keep their mobile base stations synchronised to a reference clock source. Older Ethernet services had a higher latency (transmission delay) and jitter (variation in transmission delay) and, as a result, were unable to support synchronisation.

³¹ [BCMR May 2015 consultation](#), Appendix 11, footnote 103.

ASN exchanges, in order to combine EAD and EBD circuits (see Figure 15.2 in Chapter 15). [REDACTED]

52. [REDACTED]
53. In view of the above, the use of disaggregated terminating and trunk segments in the form of leased lines may not be a close enough substitute for managed backhaul services to justify including both in the same market. Although the regulated prices of Openreach's products do constrain the price of managed backhaul somewhat, the constraint does not appear to be binding at current prices: [REDACTED].
54. Sourcing terminating and trunk connections separately may be more attractive for an MNO if the terminating segment is not purchased in the form of a leased line, but as dark fibre. Dark fibre is currently supplied by small companies like CityFibre, but it may soon be supplied by Openreach too, if Ofcom implements the recently proposed changes in regulation (see paragraph 16). Ofcom considers that access to dark fibre could give MNOs more scope for innovation and differentiation, 'both in the form of technical solutions and features, enabled by independent choice of equipment, and in the form of greater responsiveness to end-users' needs, enabled by more direct control over operational activities such as upgrades and configuration of services.' For example, individual MNOs 'could make their own decisions about whether to deploy a technology such as Cloud Radio Access Networks (Cloud-RAN) and when to deploy it, independently of the views and development timescales of BT.'³² These benefits could outweigh the cost for MNOs of using their own electronic equipment. Indeed, the Parties told us that 'reducing operating expenditure (which can be achieved by using dark fibre) is critical for MNOs, and is of higher priority than issues such as aggregation benefits from an end to end solution like MEAS.'³³
55. Dark fibre terminating segments might therefore be good substitutes (when used together with trunk connections) for managed backhaul services. However, MNOs may want to use dark fibre as an input for managed backhaul services. For example, EE told us that, [REDACTED]. Similarly, Telefónica told us that it would have to significantly increase its capability to be able to source dark fibre directly from Openreach and that it was more likely to 'source this service from other transmission providers who could build services with the benefit of access to the Openreach fibre footprint.'

³² [BCMR May 2015 consultation](#), paragraph 7.41. Cloud-RAN is a backhaul technology that allows for a more efficient use of spectrum.

³³ [BT initial submission](#), paragraph 4.17.

56. BT Wholesale's internal documents also discuss [REDACTED].
57. We are therefore of the view that, based on demand-side considerations, (active) leased lines and managed backhaul services should not be included in the same market. As for dark fibre, although substitutability with managed backhaul services may be closer, we consider that
- (a) currently, the uncertainties around the cost of dark fibre and the geographic limits of its availability imply reduced substitutability to managed backhaul; and
 - (b) even if Ofcom imposed regulated access to dark fibre from Openreach, it is still uncertain how attractive self-build would be for MNOs compared with managed services.
58. We are, therefore, of the view that managed backhaul services form part of a market separate from leased lines or (at present) dark fibre connections. In the competitive analysis, however, we will take into account any constraints that leased lines and dark fibre exert on managed backhaul services, or may exert in the future if dark fibre is more widely available and its costs more certain.

Substitutability of managed fibre mobile backhaul with other end-to-end backhaul products

59. Taking into account the views outlined above, the next step is to assess whether the relevant market should be limited to managed backhaul services provided to MNOs or should include a wider category of end-to-end backhaul products sold to other CPs.
60. The Parties told us that, unlike unmanaged leased lines (see paragraph 71 below), some managed backhaul services were specifically tailored for MNOs. They therefore considered that 'managed mobile backhaul' constituted the narrowest feasible product scope.³⁴ In particular, MEAS, which was the backhaul product more commonly purchased by MNOs, has been tailored on MNOs' needs and it is not bought by non-MNO customers. Other examples of tailored products are [REDACTED] EAC and MMWE.
61. On the other hand, MNOs are also using some end-to-end backhaul products that are sold more generally to a wider range of CPs and are mostly used to provide business connectivity; this is the case for Wholesale Ethernet, bought by EE and MBNL to serve a small number of their sites. As seen in

³⁴ The parties, however, consider that the appropriate frame of reference should be wider.

Chapter 15, paragraph [21(c)], the main difference between Wholesale Ethernet and MEAS is that the former does not include the routers at each end of the line nor end-to-end synchronisation. However, routers and a synchronisation source can be easily sourced by MNOs from third party providers.³⁵ EE told the CMA that [§].

62. This suggests that there is not a fundamental difference between the managed backhaul products used by MNOs and those bought by other CPs. However, by including all end-to-end Ethernet backhaul services in the same market, we run the risk of overestimating the competitive constraint imposed on BT Wholesale by other backhaul providers. For example, TalkTalk is one of the major suppliers of wholesale Ethernet, but it does not currently supply MNOs. When asked whether it would be able to provide backhaul services to MNOs, [§].
63. We therefore consider that including all wholesale Ethernet-based services in the same market may lead to underestimating BT Wholesale's market position in the supply of mobile backhaul, by considering as direct rivals companies which, like TalkTalk, do not currently constitute strong competitive threats. We are of the view that the relevant market should include only managed backhaul services provided to MNOs. In the competitive assessment, however, we will consider whether entry in the market, including by providers of wholesale Ethernet who do not currently supply MNOs, is likely.

Substitutability between unmanaged leased lines' terminating and trunk segments

64. An MNO that does not use managed backhaul services must deploy or lease both terminating and trunk segments in order to connect its radio base stations to its core network. The same must be done by firms who want to provide managed backhaul services to MNOs.³⁶ In connection with unmanaged leased lines, third parties have expressed concerns on foreclosure only in relation to terminating segments, where Openreach is the main provider. In this section we briefly discuss whether trunk segments should be included in the same market as terminating segments.
65. Ofcom considers terminating and trunk segments to be part of different markets. Similarly, the European Commission (the Commission) in its

³⁵ The routers must be self-supplied even if an MNO wants to use the managed backhaul service provided by Virgin Media.

³⁶ As we have seen, BT Wholesale, for example, leases terminating segments from Openreach and uses its own network for trunk connections.

recommendation on market definition in the electronic communications sector considers a separate market for terminating segments.³⁷

66. From the demand side, terminating and trunk segments are not substitutable. Trunk segments are used for long-distance connections, where traffic from different sources is aggregated to be transmitted more efficiently across the country. Terminating segments, on the other hand, reach the individual radio base stations and carry the signal to an exchange site where it can be aggregated with other traffic. From the supply side, we note that Ofcom considered the provision of trunk connectivity to be quite competitive, and for this reason found it unnecessary to regulate it. On the other hand, Openreach is by far the largest provider of terminating segments, and outside urban areas it is often the only one. Due to Openreach's prominence and the high barriers to entry, Ofcom has imposed regulation on Openreach's Ethernet-based products and, even in the latest BCMR consultation, has proposed to maintain the regulation with the only exception of the Central London Area (see paragraphs 10 to 13 above). These different competitive conditions point to the terminating and trunk segments not forming part of the same product market.
67. We therefore consider that the relevant market should not be wider than the wholesale market for terminating-segment fibre Ethernet-based leased lines.

Substitutability between terminating-segment unmanaged leased lines and dark fibre

68. The use of dark fibre in terminating segments to provide mobile backhaul connectivity is currently limited. However, it might become more prevalent in the future, especially if Ofcom mandates regulated access to Openreach's dark fibre.
69. Where available, dark fibre is used as a substitute for active leased lines. Even in the case of regulated access to Openreach dark fibre, this would broadly reproduce the types of connection currently provided with EAD and EAD LA products. Moreover, EE told the CMA that, '[X].'

³⁷ For Ofcom, see for example the final statement on the [2013 BCMR](#), published on 28 March 2013, p5. For the Commission, see '[Commission Recommendation of 17 December 2007](#) on relevant products 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'. We note that the market definitions adopted by Ofcom and the Commission have been elaborated in the context of *ex ante* regulation, with the aim of helping in the assessment of market power in the absence of regulation. Our aim is different, and we take the regulatory framework as given. Our assessments, therefore, could in general diverge from those by Ofcom and the Commission.

70. Although, unlike active products, dark fibre can allow MNOs to develop their own backhaul technology (see paragraph 54), substitutability with active leased lines appears sufficiently close to include the supply of dark fibre in the same market as active terminating-segment fibre Ethernet-based leased lines.

Substitutability of unmanaged fibre mobile backhaul with other terminating-segment unmanaged leased lines

71. Unlike managed backhaul services (see paragraph 60 above), unmanaged leased lines products are not customised for MNOs. Openreach's EAD, EAD LA and EBD products, for example, are used both as inputs to managed mobile backhaul services and as inputs for fixed business connectivity services. The same is the case for dark fibre terminating segments.
72. Although any merger-specific incentive to foreclose would relate only to MNOs, the foreclosed inputs are sold to a wider group of customers. Moreover, the incentive to foreclose MNOs may be affected by the implication that this strategy would have on sales to other types of customers.
73. For these reasons, when considering the wholesale market for terminating-segment fibre Ethernet unmanaged leased lines we do not focus exclusively on those circuits used for mobile backhaul.

Segmentation according to capacity levels

74. For the purpose of mobile backhaul connectivity, MNOs currently use circuits with a capacity (or bandwidth) of either 100 Mbit/s or 1 Gbit/s. Third parties have suggested that, in the near future, circuits with a capacity of 10 Gbit/s will become necessary to face the expected increase in mobile data traffic.
75. In the 2013 BCMR, Ofcom considered that leased lines with capacity up to 1 Gbit/s and over 1 Gbit/s belonged to separate markets. In the consultation document published in May 2015, Ofcom revised its position, including all Ethernet-based leased lines in a single market, independently of their capacity. On the demand side, Ofcom noted an unbroken chain of substitution linking active products of different capacities. On the supply side, Ofcom noted that, once in place, a network can be used to supply services of all bandwidths and interface types. This is because the services themselves differ only in the equipment at the circuit ends, and where circuits use the same interface but offer different bandwidths the equipment is virtually

identical.³⁸ Finally, dark fibre is by its nature capable of being used to supply a service of any bandwidth.

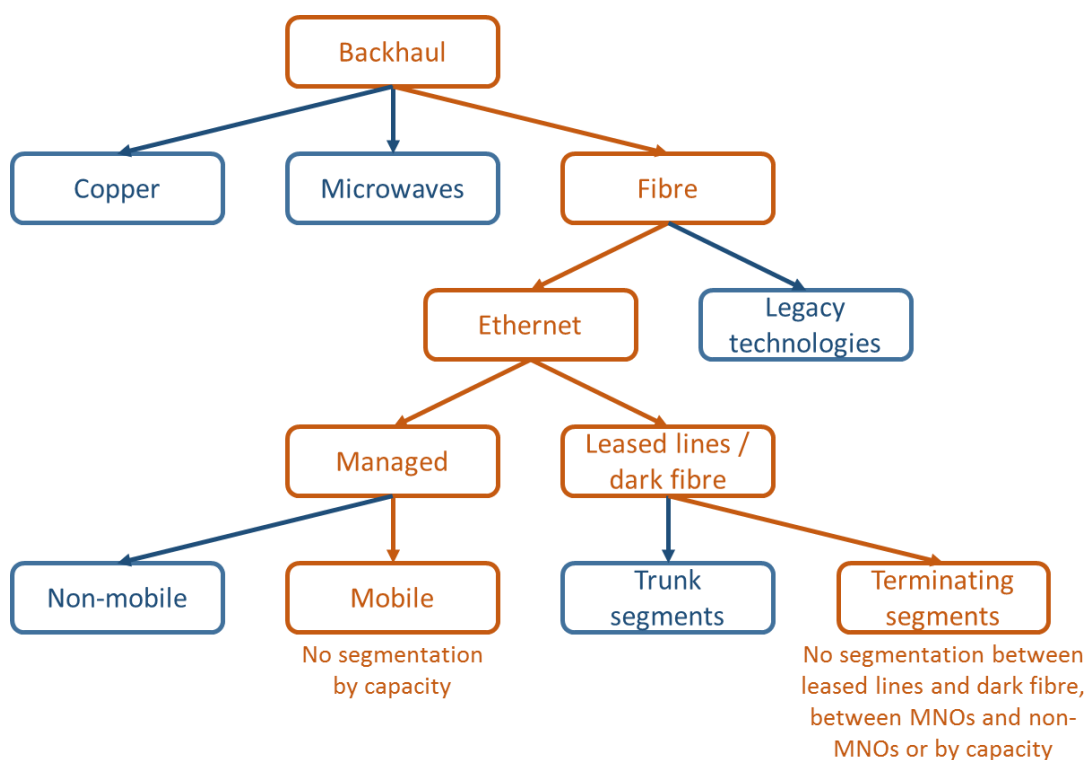
76. The observations above point towards the identification of a single market for terminating-segment fibre Ethernet-based leased lines of all bandwidths.

Summary

77. Figure 1 below summarises the various steps of the analysis developed so far, which suggests that the relevant upstream product markets for the analysis of input foreclosure in mobile backhaul may be the following two reasons:

- (a) the wholesale market for managed fibre Ethernet-based mobile backhaul; and
- (b) the wholesale market for terminating-segment fibre Ethernet-based leased lines, including dark fibre.

Figure 1: Analysis of backhaul products substitutability and definition of the relevant backhaul markets



Source: CMA.

³⁸ See Ofcom [BCMR May 2015 consultation](#), sections 4.2.3–4.2.5.

Geographic market definition

78. By the nature of the product, the markets for leased lines terminating segments are local. The major cost in the provision of leased lines is due to the deployment of the fibre lines. As this cost is proportional to the length of the lines, the provider whose nearest point of presence is the closest to a base station has a clear cost advantage; substitutability with leased lines offered by alternative providers quickly disappears as the distance between the base station and the providers' nearest point of presence increases. We note, for example, that Virgin Media is often considered an option for MNOs when a base station is located within 250 metres of Virgin Media's cable footprint.
79. However, for convenience, we will aggregate local markets in our assessment where the competitive conditions appear to be the same. For these reasons, we will distinguish between:
- (a) the Hull area, where BT is not present; in this area, no input foreclosure is possible;
 - (b) the areas within Virgin Media's network footprint and other urban areas where dark fibre providers (alternative to Openreach) may profitably operate;³⁹ and
 - (c) rural and other areas where no real alternative to Openreach is present, nor is one likely to emerge in the next few years.
80. The geographic characterisation is different for managed mobile backhaul services, as these could in principle be provided by any operators on a national basis by leasing terminating segments from Openreach.
81. However, no provider other than BT Wholesale has developed a competitive offer for managed mobile services on a national scale. The main providers of managed backhaul services are currently BT Wholesale and Virgin Media. As the use of its own infrastructure gives Virgin Media a cost advantage in the areas where its access network is present (see footnote 24), the competitive conditions are sufficiently different within and outside Virgin Media's network footprint that, in the course of the analysis, we may want to consider these two geographic areas separately.

³⁹ The WECLA is included in this category.

Further evidence and analysis supporting our findings

The incidence of backhaul on MNOs' costs

82. As shown in Table 3 below, backhaul costs account for a small proportion of an MNO's total costs.⁴⁰

Table 3: Incidence of backhaul on MNOs' costs

	<i>EE</i>	<i>H3G</i>	<i>Telefónica</i>	<i>Vodafone</i>	<i>Ofcom estimate*</i>
Backhaul costs as a percentage of total network costs	[X]	[X]†	[X]	[X]†	18
Cost of backhaul supplied by Openreach and BT Wholesale as a percentage of total network costs‡	[X]	[X]†	[X]	[X]†	[X]
Backhaul costs as a percentage of total cost	[X]	[X]†	[X]	[X]†	8
Cost of backhaul supplied by Openreach and BT Wholesale as a percentage of total costs‡	[X]	[X]†	[X]	[X]†	[X]

Source: [X]; [X]; [X]; [Ofcom response to issues statement](#), paragraph 5.38; [X].

*Some of Ofcom's estimates are taken from the 2015 Mobile Call Termination (MCT) model designed for the MCT market review, which was published in March 2015. These figures are subject to the caveat that Ofcom's 2015 MCT model was not designed to calculate backhaul costs specifically and backhaul was not explicitly considered as part of Ofcom's calibration exercise. The exact proportions used by different MNOs will also differ depending on their individual strategies.

†Opex only.

‡These percentages are obtained by multiplying the figure on the line above by the percentage of backhaul costs accounted for Openreach and BT Wholesales, as derived from Table 2.

83. A simple calculation can give a sense of the scale of backhaul costs against retail prices. Let us consider the total backhaul expenditure in 2014 by H3G, Telefónica and Vodafone and assume that these were increased by 50%. Putting aside the issue of whether these costs are fixed or variable, let us suppose they are fully passed through to retail prices. As Table 4 below shows, this would translate into an average price increase of between £[X] and £[X] per retail customer per year or, alternatively, of between £[X] and £[X] per gigabyte of mobile traffic. Note that the calculation is subject to several simplifying assumptions and the result should be interpreted just as an indication of the order of magnitude of possible price increases.

⁴⁰ The figures provided do not relate only to leased lines and managed fixed backhaul services, which are the areas of potential concern.

Table 4: A simple calculation on the impact of backhaul price increases into retail prices

	H3G	Telefónica	Vodafone
Backhaul expenditure in 2014 (£)	[X]	[X]	[X]
50% increase in backhaul costs (£)	[X]	[X]	[X]
Number of retail mobile customers in Q4 2014	[X]	[X]	[X]
Per-customer yearly cost increase (£)	[X]	[X]	[X]
Gigabytes of traffic in Q4 2014	[X]	[X]	[X]
Per-gigabyte cost increase (£)	[X]	[X]	[X]

Source: For backhaul costs, see Table 2; for customers and traffic data.

Notes:

1. The number of customers includes retail customers of MVNOs hosted by each MNO.

2. In order to compute the cost increase per-gigabyte, we have multiplied the number of gigabytes consumed in the last quarter of 2014 by four.

The evolution of backhaul costs

84. It is not clear whether, in absolute terms and as a fraction of total costs, backhaul costs will increase in the future or not. Ofcom notes that there are two directionally off-setting factors at play:

- (a) Volumes. Ofcom anticipates that the demand for data and hence backhaul capacity will increase substantially. For example, due to the growth in mobile broadband and an increasing expectation from users to access data when in large concentrations, eg events, city centres, etc, there is an increasing trend of ‘cell densification’, ie the process of providing more cells and better capacity in areas where population and usage are high. Mobile technologies designed to address some of this growth include ‘Cloud-RAN’ which has a much higher backhaul requirement as the backhaul capacity for each site has to be dimensioned to address a higher demand, as the radio capacity can be shifted from one site to another.
- (b) Prices. The per-unit cost of backhaul is likely to fall rapidly. This is partly due to regulatory requirements which reflect a decrease in the underlying costs of providing backhaul – the proposed 2016 LLCC charge control is an overall cap of CPI–13.5% year on year following a starting charge reduction of 9%. Furthermore, the cost of increasing backhaul does not increase in proportion to the extra capacity purchased. For example, upgrading from a 1 Gbit/s service to a 10 Gbit/s service does not cost ten times as much but roughly double the amount. Thus backhaul costs will not increase in proportion with the increase in data requirements, and may even fall if the reduction in underlying costs is significant enough.⁴¹

⁴¹ [Ofcom response to issues statement](#), paragraph 5.39.

85. We also note that, if Ofcom’s passive remedies are approved,⁴² the adoption of dark fibre-based backhaul may make it possible for MNOs to increase the capacity of backhaul circuits without increasing their costs, as dark fibre circuits would be priced at the level of 1 Gbit/s active circuits.
86. On the other hand, the long-term contracts between the MNOs and BT Wholesale and the associated minimum volume commitments may imply that the MNOs will not be able in the medium term to take advantage of the expected reduction in Openreach’s regulated prices (see also paragraph 121).
87. All MNOs other than EE told the CMA that they expected backhaul costs to increase as a proportion of total costs. However, EE’s draft network strategy five-year plan from September 2014 (absent the merger) forecasts a significant decline over the next five years, as shown in Table 5 below.

Table 5: EE’s estimates of backhaul costs

	2015	2016	2017	2018	2019
Total backhaul costs (£m)	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
IT and network opex and capex (£m)	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
Total expenditure (£m)	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
Total backhaul costs as a proportion of IT and network costs (%)	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
Total backhaul costs as a proportion of total expenditure (%)	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]

Source: EE.

Fixed and variable backhaul costs

88. The merging parties told the CMA that the majority of these costs reflected a fixed capacity charge and might therefore only vary if, in the longer term, capacity upgrades were required. The same point was made by H3G, which described backhaul costs as ‘lumpy’. Vodafone also told us that all backhaul charges should be considered fixed costs with respect to subscribers in the short run, since in the short run they did not vary directly by subscriber.
89. H3G provided an estimate of the size of its variable backhaul costs in 2014, for both capex and opex. H3G considered that [REDACTED].
90. To arrive at an estimate of variable network capex costs in 2014, H3G assessed the loss in revenues and capex cost savings over time associated with a hypothetical 10% reduction in customers. [REDACTED].⁴³

⁴² See paragraph 16.

⁴³ [REDACTED] and, as such, in the CMA’s view, slightly overestimate variable backhaul costs.

Table 6: H3G's backhaul capex forecasts

	£m		
	2015	2016	2017
Actual backhaul capex forecast	[REDACTED]	[REDACTED]	[REDACTED]
Hypothetical capex at 90% of customers	[REDACTED]	[REDACTED]	[REDACTED]
Saving	[REDACTED]	[REDACTED]	[REDACTED]

Source: H3G RTIR 07.08.15, question 6, Table 3 and H3G RTIR 20.08.15.

91. The backhaul cost savings shown in Table 6 have a net present value (NPV) of £[REDACTED]. H3G has used a [REDACTED] horizon for its backhaul capex forecasts as, in its opinion, this is a long enough horizon to reflect the profile of capacity-related capex in future years, and also a short enough horizon to be relevant for short-run pricing decisions.
92. The same hypothetical 10% reduction in customers would result in a [REDACTED]. The backhaul capex saving is therefore approximately [REDACTED]. Multiplying this percentage by H3G's revenues in 2014 (£[REDACTED]), H3G reaches an estimate of the variable backhaul capex in 2014 of £[REDACTED].
93. H3G has followed the same approach to estimate the level of its variable backhaul opex. The opex costs identified as variable are the ongoing opex costs associated with the variable capex identified. H3G's estimate of variable opex for 2014 related to mobile backhaul costs is £[REDACTED]. The overall backhaul-related variable costs (capex and opex) have therefore been estimated at £[REDACTED].
94. H3G's estimation is based on its own investment plans and is therefore difficult to directly extend to other MNOs. Moreover, it is based on expected investments in the next [REDACTED] years, and may give different results if applied to the more distant future. However, considering that the next [REDACTED] years are going to see substantial network improvement by H3G, which is currently expanding its 4G network, H3G's variable backhaul costs may not be significantly higher in the future. And although the values cannot be applied directly to other MNOs, the order of magnitude is probably representative of the size of variable backhaul costs in the industry.

Quality in the context of mobile backhaul

95. Quality has many dimensions in the context of mobile backhaul. For MNOs sourcing backhaul from BT Wholesale, Openreach and BT Wholesale are responsible for different aspects of quality. Quality degradation may have different impacts on MNOs depending on which aspect of quality is affected.

Openreach

96. Openreach is responsible for the provision of the terminating segments of backhaul connections. The main quality dimensions for Openreach backhaul products are
- (a) the speed of delivery of new links or of upgrade of existing links; and
 - (b) the speed of repairs.
97. When considering the possible impact of quality degradation on MNOs, it is important to note that a reduction in the quality of the Openreach products would have a direct impact on the services that all MNOs receive from BT, because these products are inputs for managed backhaul services that MNOs purchase from BT Wholesale. Therefore the fact that currently [redacted] is not relevant when assessing the ability to foreclose through quality discrimination.
98. Moreover, the merged entity's ability to harm competing MNOs by discriminating on service quality is not affected by the cost of backhaul in relation to the value of the downstream product if no alternatives to Openreach products exist. In fact, a significant worsening of the quality of backhaul would directly lead to a reduced quality of the retail mobile services. In this regard, we note that in most rural areas, and in many geographic areas outside Virgin Media's network footprint, there is no provider of leased lines alternative to Openreach. This, in principle, may give the merged entity the ability to foreclose rival MNOs even if the overall cost of backhaul is small.
99. The CMA has received contrasting views on the impact on MNOs of reduction in the quality of Openreach services. On the one hand, any impact on MNOs would generally be temporary and affect particular local areas. As Openreach is involved only in the provision of terminating segments, delays on delivery or repair would affect only those base stations connected with a given fibre link, but would have no implications on the rest of the MNOs' networks. Moreover, according to Ofcom the degradation of the speed of repair is unlikely to have any material impact on MNOs' retail offer, as the fault rate is not high enough.
100. In the case of late delivery, the impact on MNOs may be relatively small even locally. In fact, the merging parties noted that MNOs planned their requirements with plenty of lead time to ensure that any upgrades or new circuits were in place well before capacity constraints were reached.⁴⁴ This has been confirmed to us by [redacted]. Therefore, delays in upgrades or new

⁴⁴ [BT/EE response to issues statement](#), paragraph 12.6(b)(iv)(A).

deliveries would not, in most cases, determine a capacity constraint, and therefore a degradation of the service MNOs provide to their retail customers.

101. On the other hand, Vodafone told the CMA that H3G, Telefónica and Vodafone itself are extending their 4G network to catch up with the coverage and speeds already achieved by EE. Delays in deployment of new backhaul circuits may directly delay the expansion of the MNOs 4G network. In this context, Vodafone told us, [REDACTED].
102. Moreover, in those cases in which an MNO does experience a backhaul capacity constraint, a delay in upgrading the connection may have a significant impact on customer churn at local level. H3G, for example, told us that its analysis of customer behaviour showed a [REDACTED]% higher propensity to churn if customers' most used cell was temporarily congested below 400 Kbit/s.
103. Finally, it must be noted that Ofcom imposed on BT's Ethernet products a requirement to provide information on quality of service and a Service Level Guarantee (SLG) Direction, in place since 2008. The SLG Direction requires that BT's terms and conditions for the supply of Ethernet services provide scope for it to pay compensation for non-delivery and fault repair that must be provided proactively.
104. Openreach is also responsible for the development of new products which MNOs may want to use when sourcing terminating segments. For example, any dark fibre product (for backhaul terminating segments) should be developed by Openreach. In addition, it is Openreach which is responsible for the development of solutions allowing the deployment of small cells on street infrastructure.

BT Wholesale

105. When providing backhaul services to MNOs, BT Wholesale is directly responsible for several aspects of quality:
 - (a) BT Wholesale is responsible for sending requests for new deliveries, upgrades and repairs to Openreach. This means that BT Wholesale could degrade the speed of upgrades and repairs even independently of Openreach, with the same implications seen in paragraphs 97 to 102 above.
 - (b) BT Wholesale manages the routers and controls the actual transmission of data across the network. It is therefore responsible for the speed and reliability of the connections. In particular, BT Wholesale is responsible for

the network's performance in terms of latency, jitter and packet error loss rate, [REDACTED].

- (c) BT Wholesale is also responsible for the development of those technological solutions that affect the performance of BT Wholesale's own core network and that, in turn, influence BT Wholesale's ability to provide advanced backhaul services to MNOs.

106. Degradation of quality aspects in (b) above may have different impacts depending at which level of the network's architecture the degradation occurs.

- (a) Issues with the routers at the radio-site end of a link would have only a local impact.
- (b) Traffic congestion affects larger areas the closer it is to the core backhaul: the higher order the issue, the bigger impact it will have on MNOs' retail customers. [REDACTED]. A serious issue in the aggregation part of the backhaul network, therefore, may potentially have nationwide and long-lasting effects on MNOs' competitiveness. The impact on churn, even for a temporary effect, may be similar to that seen in paragraph 102, but at a national level.

107. BT has told the CMA that its core network has the ability to prioritise traffic into three separate streams (referred to as classes of service). All traffic that travels via BT's aggregation network is carried in one of these streams and BT has no ability to give preference to any traffic within an individual stream. Therefore all traffic carried within each stream is treated equally whether it relates to mobile, broadband, Ethernet or any other products carried over the network. [REDACTED], MNOs using the MEAS IP/VPN service can choose to prioritise their traffic into any of the three streams, depending on their requirements.⁴⁵ [REDACTED]

108. In relation to technological innovation (see paragraph 105(c) above), [REDACTED] is concerned that BT Wholesale may delay or deny the development of phase synchronisation, a technology that MNOs need in order to use TDD spectrum and that requires the installation of precise clocks. The reason suggested is that EE, thanks to its larger spectrum holdings, will not need to use TDD spectrum as soon as other MNOs. BT [REDACTED] already own TDD spectrum in the 2.6 GHz band, but they currently do not use it for mobile communications;

⁴⁵ An IP virtual private network (VPN) links two or more network nodes through an underlying data network, while further encapsulating the data and keeping it private. This allows packet traffic to travel through a specific path within a shared network and ensure the information is not leaked to other users of the same network.

additional TDD spectrum will become available at the next spectrum auction, likely to be held in 2016. [✂]

109. Failure to develop this technology might have serious implications on rival MNOs' ability to compete, as they would not be able to use TDD spectrum. The most likely effect, however, would be an increase in MNOs' costs due to the necessity of adopting alternative technologies to provide phase synchronisation (see paragraph 16.164).

BT's ability to increase Openreach's prices

110. BT's ability to increase prices for Ethernet products used for backhaul is restricted by an Ofcom charge control. The current charge control prevents it from making any nominal price increases for Ethernet leased lines and related interconnection services. Ethernet products are also subject to an overall RPI-11.5% price cap, which requires an overall reduction in prices. BT's ability to decrease the prices of products used for mobile backhaul more slowly than those of other products in the Ethernet basket is also limited by a further sub-basket for EAD 1Gbit/s, a product widely used for mobile backhaul (see paragraph 4(b)), that requires these services to decrease in line with the overall basket of services. The charge control is summarised in Table 7 below.⁴⁶

Table 7: Charge control on Ethernet products (April 2013 to March 2016)

	<i>Services within scope</i>	<i>Price cap</i>	<i>Sub-baskets and sub-caps</i>
Ethernet basket	Connection and rental charges for: <ul style="list-style-type: none"> Ethernet services (up to and including 1Gbit/s) outside the WECLA Ethernet services (above 1Gbit/s) outside the WECLA Ethernet ancillary services (excluding ECCs) Interconnection services 	RPI-11.5%	Interconnection services sub-basket (RPI-11.5%) EAD 1 Gbit/s sub-basket (RPI-11.5%) Ethernet all services sub-cap (RPI-RPI)*
AISBO services in the WECLA	Wholesale low bandwidth AISBO services (up to and including 1Gbit/s) in the WECLA	RPI-RPI* on each service	

Source: Ofcom 2013 BCMR.

*An RPI-RPI cap means that prices are prevented from increasing in nominal terms.

⁴⁶ Ofcom 2013 BCMR, Figure 20.1 and paragraph 21.5.

111. A very similar approach to charge control has been proposed by Ofcom in the recent LLCC consultation, in view of the 2016 BCMR. The main differences are

- (a) the deregulation of Ethernet services in the Central London Area;
- (b) a less strict cap on Ethernet services above 1 Gbit/s; and
- (c) the adoption of a CPI–X cap, instead of an RPI–X cap.

112. Ofcom has also proposed that BT implement a starting charge adjustment of minus 9% to charges in the Ethernet basket. Under the proposal, BT will have flexibility in implementing this adjustment, subject to the sub-basket and sub-cap constraints.⁴⁷ The proposed charge control is summarised in the following table.⁴⁸

Table 8: Proposed future charge control on Ethernet products (April 2016 to March 2019)

	<i>Services within scope</i>	<i>Price cap</i>	<i>Sub-baskets and sub-caps</i>
Ethernet basket	Connection, rental and main link charges for: <ul style="list-style-type: none"> • Wholesale CISBO services up to and including 1Gbit/s outside the CLA • Interconnection services • Ethernet ancillary services (excluding ECCs and TRCs) 	CPI–13.75%	Sub-basket for EAD 1Gbit/s (CPI–13.75%) Sub-basket on main link charges (CPI–13.75%) Sub-basket on interconnection services (CPI–13.75%) Sub-cap on all charges (CPI–CPI)*

Source: Ofcom [BCMR May 2015 consultation](#).

*A CPI–CPI cap means that prices are prevented from increasing in nominal terms.

113. For services above 1 Gbit/s, Ofcom proposes a safeguard cap applied to each and every charge preventing any nominal price increases. The reason for this is that services above 1 Gbit/s would be effectively constrained by dark fibre. As seen in paragraph 16, the price of a dark fibre circuit would be set at that of the corresponding 1 Gbit/s active product (EAD LA or EAD), minus the LRIC of its active elements. A dark fibre circuit, however, can be used to provide any level of capacity. As a consequence, according to Ofcom, the constraint from dark fibre makes charge control on active products above 1 Gbit/s less important.⁴⁹

⁴⁷ Ofcom, Leased lines charge controls and dark fibre pricing, consultation document published in June 2015 ('[2015 LLCC Consultation](#)'), paragraph 6.6.

⁴⁸ *ibid*, Table 6.1.

⁴⁹ See Ofcom [BCMR May 2015 consultation](#), paragraph 8.190.

114. Vodafone has expressed the concern that, notwithstanding the charge control, the merged entity might still be able to increase the costs to rival MNOs by altering the relative prices of EAD and EAD LA, which are included within the same basket, in such a way that the overall cost to MNOs will increase.⁵⁰
115. However, we consider it unlikely that the merged entity would have the ability to foreclose rival MNOs by adopting this strategy. In fact, [X]. [X]. It is therefore unlikely that the merged entity would be able to significantly increase the cost of Vodafone's self-supplied backhaul or of backhaul provided by alternative suppliers by concentrating the substantial price reductions required by Ofcom's price cap on either EAD or EAD LA products.
116. Moreover, if BT were to price in a way that discriminated against a downstream customer without justification – even if that pricing scheme were compliant with the charge control – this would be considered a breach of its SMP condition of non-discrimination (see paragraph 11(c)). In practice, if BT did discriminate, this could either be the subject of enforcement action by Ofcom or MNOs could bring a formal dispute to Ofcom, for it to investigate and resolve. Under the provisions of the Communications Act 2003, Ofcom is required to resolve such disputes within four months of accepting them (unless exceptional circumstances apply).⁵¹
117. Sky has mentioned to the CMA two additional ways in which the merged entity could discriminate against rival MNOs:
- (a) Openreach may calibrate a volume-based discount scheme that affords limited opportunity for rival MNOs to benefit from the largest discounts, but allows EE to benefit in line with its level of demand.
 - (b) Openreach may differentiate the prices of the various link lengths so to favour the propagation characteristics of its own spectrum, whilst discriminating against new acquirers of higher frequency spectrum.
118. In relation to volume discounts, we have to consider two options:

⁵⁰ [Vodafone initial submission](#), paragraph 2.43(iii).

⁵¹ Ofcom's main power in resolving a dispute is to do one or more of the following:

- to make a declaration setting out the rights and obligations of the parties to the dispute;
- to give a direction fixing the terms or conditions of transactions between the parties to the dispute;
- to give a direction imposing an obligation, enforceable by the parties to the dispute, to enter into a transaction between themselves on the terms and conditions fixed by Ofcom; and
- to give a direction, enforceable by the party to whom the sums are to be paid, requiring the payment of sums by way of adjustment of an underpayment or overpayment.

A determination made by Ofcom for resolving a dispute binds all parties to the dispute. It is also open to Ofcom to exercise its powers to set, modify or revoke regulatory conditions (including SMP conditions and general conditions) as a result of its consideration of a dispute.

- (a) If the volume discount is on top of regulated prices, which are set in accordance with Ofcom's charge control, then, post-merger, a discount that only EE can get would not harm rival MNOs. In fact, payments from EE to Openreach would constitute internal transfers, so that their amount would have no impact on EE's competitive strength.
- (b) If, on the other hand, volume discounts are a way in which Openreach complies with the charge control, then a discount that favours EE would be in breach of the non-discrimination requirement imposed on BT. The 2013 BCMR specifies that 'the obligation not to discriminate unduly should also apply to pricing discounts.' In particular, volume discounts 'would very often constitute undue discrimination in practice since BT's downstream divisions would almost inevitably be the main beneficiary giving rise to a strong potential for anti-competitive effects.'⁵² This principle has been reaffirmed by Ofcom in the May 2015 consultation document.⁵³

119. As for the second concern in paragraph 117, Sky suggested that higher frequency spectrum (such as 3.4 GHz) required a denser deployment of cells and so, potentially, backhaul links of different length. The merged entity could therefore price circuits of different lengths in a way that favoured the propagation characteristics of 2.6 GHz spectrum, of which it owned a large amount, compared with higher frequency spectrum, which could be obtained by other MNOs at the next spectrum auction. This might be possible since backhaul prices were currently not linear in circuit's length, because of the higher price of EAD, whose price varied with the length of the circuit, compared with EAD LA, which was priced independently of the length of the circuit.⁵⁴

120. There are, however, reasons to believe that such discriminatory behaviour would not be possible. First of all, UK Broadband told the CMA that, in dense urban areas, the number of cells needed to provide coverage with 2.6 GHz and 3.5 GHz spectrum was virtually the same. We note that high-frequency spectrum would be mainly used for small cells deployed in urban areas. The scope for price discrimination based on circuit length is therefore limited. Moreover, pricing strategies that, although complying with the charge control, explicitly discriminate between CPs, would be in breach of the non-discrimination condition and MNOs could bring a dispute to Ofcom.

⁵² Ofcom [2013 BCMR](#), paragraph 12.112.

⁵³ See paragraph 8.72.

⁵⁴ Openreach's current prices for EAD are generally higher than for EAD LA, even if the lengths of corresponding links are the same, and [Ofcom's BCMR](#) highlights that BT's returns for EAD 1 Gbit/s are significantly higher than for EAD LA.

The impact of Openreach prices on the prices paid by MNOs

121. As we have seen in Table 3, backhaul costs represent a small part of the overall costs incurred by MNOs. Moreover, any change to Openreach's prices may have a limited impact on MNOs' costs in the short run. As seen in Table 1, [REDACTED]. The other MNOs [REDACTED].⁵⁵
122. The impact of changes to Openreach prices might be larger in the medium term, as the current contracts between the MNOs and BT Wholesale expire or as new contracts have to be negotiated for the provision of backhaul to small cells.

Evidence on past discriminatory behaviour by Openreach

Provision times

123. In its final reports from 2013, 2014 and 2015, the EAB noted that the percentage of orders of EAD products provided by Openreach on time was consistently higher when the customer was one of the other BT divisions than when the customer was a non-BT CP. The EAB, however, caveated this observation by noting that the difference appeared to depend on differences in the use of the 'deemed consent' process. Deemed consent is a process whereby Openreach changes its target completion date if an order is delayed for reasons beyond its reasonable control. In these cases, the customer's consent in delaying the order is assumed. In the data published by the EAB, an order is considered provided on time if it is provided within the latest completion date. This, however, is often different from the initially stipulated completion date, due to the use of deemed consent.⁵⁶ The 2014 reports notes that, 'when the absolute cycle times for orders are compared (thereby excluding the impact of deemed consent), the skew of the performance statistics towards BT [divisions] disappears.'⁵⁷ The same result was found in 2015.⁵⁸
124. In the BCMR May 2015 consultation document, Ofcom provides the result of a similar analysis and reaches the same conclusions: when the initially stipulated completion date is considered and when delays due to customers'

⁵⁵ [REDACTED] [REDACTED]

⁵⁶ See Ofcom [BCMR May 2015 consultation](#), Table A17.17.

⁵⁷ [EAB final report, 2014](#), p19.

⁵⁸ See [EAB final report, 2015](#), p20.

behaviour are excluded, Ofcom finds no evidence of systematic bias against BT's rivals.^{59,60}

125. These results suggest that the difference in the percentage of orders Openreach provides on time to BT and non-BT CPs may be due to:
- (a) the different policies of CPs towards accepting a deemed consent;⁶¹ or
 - (b) a greater accuracy from Openreach in the estimation of the completion date for orders made by other BT divisions.⁶²

Openreach 'Project Services'

126. The EAB reports also suggest that part of the difference in the timeliness of provision might be due to the fact that BT divisions purchase a higher volume of 'project managed services' with their orders. The EAB does not consider this to be a problem, as the project-managed service is available from Openreach to all CPs on an equivalent basis under its Project Services contract.⁶³
127. It can be argued that the price charged by Openreach for Project Services is an internal transfer within the BT Group when the customer is a BT division, while it is a real cost for non-BT customers. While the 2015 EAB report concludes that this does not raise compliance concerns,⁶⁴ we consider that performance differences in service provision due to the purchase of project management from Openreach could be considered evidence of discriminatory behaviour, especially if delivery times were shorter when Project Services were used.

⁵⁹ Ofcom notes that Category 4 orders (in which a new core fibre cable is required between exchanges) are a possible exception; however, these constitutes less than 5% of all orders. See [BCMR May 2015 consultation](#), paragraph A17.163.

⁶⁰ Vodafone told the CMA that the fact that a highly disproportionate volume of Vodafone orders were being delayed by over 159 working days ('tail' orders) suggested potential discrimination by Openreach (see [Vodafone response to provisional findings](#), paragraph 2.4). [§<]. In any case, we consider it is not appropriate to draw general conclusions from a snap-shot of the proportion of 'tail' orders. Ofcom's conclusions, on the other hand, are based on an assessment of provisioning times across all order types over the period 2011-2014.

⁶¹ The EAB observed differences in these policies among CPs (see [EAB final report, 2014](#), p8).

⁶² Vodafone told the CMA that Ofcom had recently provisionally concluded that several categories of behaviour by BT in relation to the use of 'deemed consent' were not in accordance with BT's SMP obligations and/or the terms of its Connectivity Service Agreement ([Vodafone response to provisional findings](#), paragraph 2.25). However, as can be seen in the document published by Ofcom ([Dispute between Vodafone and BT concerning Deemed Consent in relation to the provision of Ethernet Services](#)), Ofcom simply considered whether the types of alleged behaviour were consistent with BT's obligations, but did not investigate whether Openreach had indeed engaged in such behaviour. In any case, even if Openreach had behaved in these ways, this did not result in higher provisioning times for non-BT CPs (see paragraph 123 above).

⁶³ See [EAB final report, 2014](#), p19.

⁶⁴ See [EAB final report, 2015](#), p6.

128. However, in its analysis of Openreach quality of service Ofcom did not find evidence that Project Services orders received favourable treatment.⁶⁵ Moreover, while the EAB notes that, when Project Services are used, there is higher certainty around delivery dates, it does not mention differences with respect to delivery times.

Fault repairs

129. Ofcom's analysis of the timing of fault repairs led it to conclude that 'Ethernet repair performance has generally been maintained at a good level since 2011.'⁶⁶

The history of regulatory decisions on the jumpering of MPF

130. TalkTalk indicated Openreach's choice of MPF technology as an example of discrimination against non-BT CPs. CPs competing with BT in fixed communication services through LLU use MPF, whereas BT does not use it itself in any material volume; this creates an incentive to discriminate by raising the costs of MPF. Openreach provides double-jumpered MPF (DJ-MPF). In May 2012, TalkTalk submitted an SoR for a single-jumpered MPF (SJ-MPF), which Openreach rejected in December 2012. TalkTalk then brought a dispute to Ofcom in 2013.⁶⁷
131. According to TalkTalk, in its dispute resolution decision in 2014, Ofcom concluded that SJ-MPF was not (at that point in 2014) worth developing since, due to low future MPF growth, it would not be cost effective. However, Ofcom accepted that Openreach had been aware of the cost saving in 2008. Further, if SJ-MPF was launched in 2008 it would have resulted in cost savings since there was high growth in the number of MPF lines in that period.⁶⁸
132. However, TalkTalk's views appear inconsistent with the regulatory decisions that have been taken with respect to MPF:

⁶⁵ Ofcom, however, did not find sufficient evidence to conclude that Project Services orders did **not** receive favourable treatment. While the data shows that Project Services orders are typically subject to more changes and greater delay than standard orders, these orders are also on average likely to be more complex to provide. It is therefore difficult to estimate the counterfactual performance for a given order had it not been provisioned under Project Services. See [BCMR May 2015 consultation](#), paragraphs A17.158–160.

⁶⁶ [BCMR May 2015 consultation](#), paragraph A17.167.

⁶⁷ For an explanation of the technical characteristics of DJ-MPR and SJ-MPF, see Ofcom (2012), [Charge control review for LLU and WLR services](#), Annex 9.

⁶⁸ [TalkTalk response to provisional findings](#), paragraph 9.16.

- (a) TalkTalk first submitted an SoR for a variant of SJ-MPF to Openreach in October 2010, which Openreach rejected. TalkTalk, however, did not bring a dispute about this decision to Ofcom.
- (b) In the 2012 LLU charge control statement, Ofcom considered that SJ-MPF had ‘the potential to be more efficient in certain specific circumstances for some operators’, but did ‘not consider that it [was] clearly the most efficient way to provide MPF because the structure of the cost base [was] different’.⁶⁹
- (c) In the 2014 fixed access charge control statements, Ofcom considered that it was reasonable for Openreach to continue using DJ-MPF until there was industry support for SJ-MPF, for the following reasons:
 - (i) DJ-MPF was originally developed through industry-wide discussions overseen by the Office of the Telecommunications Adjudicator;
 - (ii) SJ-MPF would be sufficiently different from DJ-MPF that it should be considered a different product; changing the product to SJ-MPF could make some LLU operators worse off; and
 - (iii) the coexistence of SJ-MPF and DJ-MPF would have put upward pressure on the unit cost of DJ-MPF.⁷⁰
- (d) Ofcom therefore considered that:
 - (i) It would not have been reasonable for Openreach to introduce SJ-MPF before assessing TalkTalk’s first SoR in October 2010; and
 - (ii) at that time, there could not have been certainty that SJ-MPF would have reduced costs overall.⁷¹

133. In view of Ofcom’s assessments summarised above, we do not consider that Openreach discriminated against non-BT CPs in the provision of MPF products.

⁶⁹ Ofcom (2012), *Charge control review for LLU and WLR services*, paragraph A9.3.

⁷⁰ Ofcom (2014), *Fixed access market reviews: wholesale local access, wholesale fixed analogue exchange lines, ISDN2 and ISDN30 – Annexes*, paragraph A27.35.

⁷¹ *ibid*, paragraphs A.27.35–36.

The merged entity's ability to increase MNOs' backhaul costs or to reduce the quality of the backhaul services they use by withdrawing supply (total foreclosure)

The case of Telefónica and H3G

134. In this subsection we consider the implications of the theoretical framework for the case of foreclosure of Telefónica and H3G.
135. Currently, H3G's and Telefónica's preferred alternatives would be either using dark fibre supplied by companies like CityFibre or Zayo ([REDACTED]), or purchasing managed backhaul services from Virgin Media or from other potential suppliers (an option preferred by Telefónica, as seen in paragraph 55). The most likely potential suppliers of managed mobile backhaul would be Vodafone, which already self-supplies part of its fibre circuits, and TalkTalk.
136. Virgin Media is currently the only large alternative provider of managed backhaul. Although we have limited data on pricing, there is some evidence that Virgin Media and BT Wholesale are currently offering very similar prices, as would be expected in view of our analytical framework (see Chapter 16, paragraph [16.94]). For example, the price difference between Virgin Media and BT Wholesale at a tender launched by MBNL in 2014 was around [REDACTED]%. We therefore need to assess whether, post-merger, the other current or potential suppliers of backhaul would exert sufficient competitive pressure on Virgin Media.
137. We have considered in paragraph 58 that dark fibre does not impose a strong competitive constraint on managed backhaul service. Dark fibre from companies like CityFibre or Zayo is still not available on a large scale. [REDACTED] [REDACTED] [REDACTED]. Moreover, these providers cannot reach all the radio sites of an MNO; for example, an initial estimate suggests that they could potentially reach [REDACTED]% of MBNL's sites.⁷² Therefore, they would not be active competitors in a significant part of the country, especially in rural areas. We conclude that the constraint imposed by dark fibre providers is unlikely to be strong enough to discourage Virgin Media from increasing the price (or reducing the quality) of managed backhaul services, once competition from BT Wholesale becomes weaker.

⁷² [REDACTED]

138. [REDACTED]. In principle, therefore, Vodafone could provide the same service to other MNOs. For example, [REDACTED]. [REDACTED].⁷³
139. However, Vodafone may be unable to supply backhaul at the same prices as BT Wholesale, [REDACTED].⁷⁴
140. The merging parties see TalkTalk as the most likely entrant into the market for managed mobile backhaul, as it owns a quite extensive network and already competes in the provision of Ethernet products to non-MNO customers. However, [REDACTED].⁷⁵
141. For the reasons above, in the case of reduced competition from BT Wholesale, it appears possible that neither Vodafone nor TalkTalk may impose a sufficiently strong competitive pressure to keep the prices and quality of managed backhaul services at their pre-merger levels.
142. The analysis above suggests that the merged entity may have the ability to increase the cost or reduce the quality of managed backhaul services purchased by H3G and Telefónica, when their current MEAS contracts are due for renewal.

The merged entity's ability and incentive to deny access to circuit capacity upgrades under the current contracts between BT Wholesale and the MNOs

143. If upgrading an existing circuit becomes impossible or too costly, an MNO has two options: it can add another circuit to the existing one, or it can wait until the existing circuit is no longer committed with BT Wholesale. The incentive to foreclose would therefore depend on:
- (a) Whether foreclosed MNOs would decide to postpone circuit upgrades (and/or to pass-through part of the cost increase into retail prices) and the impact that this would have on MNOs' competitiveness. We note that, if the MNOs can purchase a second circuit, their downstream losses in case they wait cannot be larger than the cost of the redundant circuit.
 - (b) How much of the traffic lost by the foreclosed MNOs diverts to the merged entity.

⁷³ [BT/EE response to issues statement](#), paragraph 12.5(ii)(B).

⁷⁴ [REDACTED]

⁷⁵ It could be argued that, in case of a foreclosure strategy from the merged entity, TalkTalk might have an increased incentive to supply mobile backhaul because, having an MVNO contract with Telefónica, it would be affected by the increase in backhaul costs. However, TalkTalk's small market share in the retail mobile market ([REDACTED]% in terms of subscribers), even in relation to its host MNO, which has a [REDACTED]% market share, implies that the impact on TalkTalk of an increase in backhaul costs is likely to be too small to significantly modify TalkTalk's incentives in relation to the supply of backhaul to MNOs.

- (c) The foregone wholesale profits.
- (d) The impact on BT Wholesale’s ability to renew the contracts with the MNOs. If foreclosed, H3G and Telefónica MNOs may be incentivised to look for alternative backhaul suppliers once their current contracts with BT Wholesale are due for renewal. As the analysis in Chapter 16 (paragraphs [16.85] to [16.123]) suggests that the merged entity may not have the incentive to foreclose them at contract renewal, any incentive to do so under the current contract would be reduced. [X]

The case of Vodafone

144. The following table shows how many of the EAC circuits currently bought by Vodafone would need a capacity upgrade in the next years. The figures are likely to significantly underestimate Vodafone’s overall need for higher capacity circuit, as the table considers only the [X] sites at which EAC circuits are in place, [X].

Table 11: Vodafone sites that currently use EAC circuits purchased from BT Wholesale and would require capacity above 1Gbit/s

Financial year [X]	[X]		[X]		[X]	
	[X]	[X]	[X]	[X]	[X]	[X]
2015/16	[X]	[X]	[X]	[X]	[X]	[X]
2016/17	[X]	[X]	[X]	[X]	[X]	[X]
2017/18	[X]	[X]	[X]	[X]	[X]	[X]
2018/19	[X]	[X]	[X]	[X]	[X]	[X]
2019/20	[X]	[X]	[X]	[X]	[X]	[X]
2020/21	[X]	[X]	[X]	[X]	[X]	[X]
2021/22	[X]	[X]	[X]	[X]	[X]	[X]
2022/23	[X]	[X]	[X]	[X]	[X]	[X]
2023/24	[X]	[X]	[X]	[X]	[X]	[X]
2024/25	[X]	[X]	[X]	[X]	[X]	[X]

Source: Vodafone.

145. [X]

146. Purchasing an additional circuit is likely to be more costly than upgrading the one already in use. A reasonable upper bound for the cost difference is given by what Vodafone pays for the existing 1 Gbit/s circuit.⁷⁶ The current contract stipulates the following rental charges for EAC circuits.⁷⁷

⁷⁶ Vodafone always has an outside option: it can buy an additional circuit directly from Openreach. In the counterfactual, BT Wholesale would agree to upgrade the existing circuits for a price not lower than the regulated price of the upgraded Openreach circuit and not higher than the sum of this price and the rental charge of the circuit currently in use.

⁷⁷ [X]

Table 12: Rental charges for EAC circuits under the current contract between Vodafone and BT Wholesale

[REDACTED]

Source: Agreement between Vodafone and BT for the provision of telecommunications transmission services in relation to Vodafone's network.

147. Considering that the need for higher capacity link will emerge mainly in densely populated urban areas, it is likely that the length of the links would be small and that, in many cases, local access circuits would be used. Therefore, we consider that the average yearly rental charge will probably be lower than £[REDACTED]. Given [REDACTED], we consider that the cost increase would be sufficiently small not to have a significant impact on Vodafone's competitiveness.⁷⁸ It must also be noted that the cost increase would be temporary, ending when the current circuits will no longer be committed to BT Wholesale.

The case of H3G

148. The following chart shows the number of high capacity circuits that H3G expects to need in the next five years, based on its estimates of future mobile traffic. [REDACTED]

Figure 2: [REDACTED]

[REDACTED]

Source: [REDACTED]

149. [REDACTED]. As seen in Chapter 16, [REDACTED].

150. In the same period, based on technical demand forecasting, the number of additional sites at which EE expects its backhaul requirements will exceed its share of the capacity of a single 1 Gbit/s circuit is [REDACTED]: approximately [REDACTED] in 2016, [REDACTED] by 2017 and [REDACTED] by 2018.

151. We note that, [REDACTED].⁷⁹ [REDACTED]

152. Excluding these [REDACTED] sites, [REDACTED]. [REDACTED], and this constrains the amount that H3G would be willing to pay for circuit upgrades. [REDACTED].⁸⁰

⁷⁸ As shown in Figure 16.1 in Chapter 16, [REDACTED] It may be also noted that [REDACTED]. It therefore appears unlikely that BT Wholesale would have the ability to deny a capacity upgrade after [REDACTED].

⁷⁹ [REDACTED]

⁸⁰ Coventry Agreement, Schedule 3, paragraph 7.4(b), and Co-operation Agreement, clause 12.11.

Margin squeeze through a reduction of retail prices

153. While the merged entity would base its retail mobile prices on the underlying incremental costs of fibre backhaul, competing MNOs would have to base their choices on the (higher) prices charged by Openreach or BT Wholesale. In other words, EE would benefit from the elimination of double marginalisation in backhaul, while the other MNOs would not.
154. Vodafone argued that mobile backhaul prices were indeed significantly above the incremental cost, noting that:
- (a) the regulated prices for EAD and EAD LA products were currently on ‘glide paths’ towards cost oriented prices, with year-on-year price changes determined by RPI–12%, implying that prices were currently above costs; and
- (b) Ofcom allowed Openreach considerable discretion as to how to recover common costs. It was evident from the pricing of different speed variants of EAD that Openreach recovered more common cost from higher-speed variants, since the increases in price for higher speeds (which were more or less linear) bore no relation to the increases in incremental cost to Openreach of increasing the speeds (which simply involved modifications to the electronics on each end of the fibre).
155. Data from Ofcom confirms that the price of Openreach products is sometimes significantly higher than its incremental costs. This is particularly the case for the products most used by MNOs, ie the 1 Gbit/s EAD and EAD LA products.

Table 13: Cost and prices of Openreach Ethernet products (outside the WECLA)

Charging element	Type	Capacity	£ per circuit		
			Price	LRIC	Contribution to common costs
Annual rent	EAD	10 Mbit/s	[X]	[X]	[X]
		100 Mbit/s	[X]	[X]	[X]
		1,000 Mbit/s	[X]	[X]	[X]
	EAD LA	10 Mbit/s	[X]	[X]	[X]
		100 Mbit/s	[X]	[X]	[X]
		1,000 Mbit/s	[X]	[X]	[X]
Connection	EAD	10 Mbit/s	[X]	[X]	[X]
		100 Mbit/s	[X]	[X]	[X]
		1,000 Mbit/s	[X]	[X]	[X]
	EAD LA	10 Mbit/s	[X]	[X]	[X]
		100 Mbit/s	[X]	[X]	[X]
		1,000 Mbit/s	[X]	[X]	[X]

Source: Ofcom

Notes:

1. The source for the costs is BT’s 2013/14 Regulatory financial statements. The prices are 2015/16 prices as announced on 1 April 2015, adjusted to take into account how much they will need to come down in the coming year to comply with the current charge control of RPI–11.5%.

2. The WECLA is the West East and Central London Areas as defined by Ofcom in the 2013 BCMR.

156. We now assess whether the reduction in the cost of backhaul that EE would experience post-merger due to the elimination of double marginalisation could be sufficiently large to allow a reduction of retail prices that could give origin to a margin squeeze.
157. According to BT, the contract between MBNL and BT Wholesale for the provision of mobile backhaul is expected to generate, in the year 2015/16, a variable margin for BT Wholesale of £[X] million (see Table 14 below). The regulated prices BT Wholesale will have to pay for the Openreach inputs used in the context of the MBNL contract is estimated at £[X] million. [X] above suggests that the LRIC of these inputs might be as low as [X] of the price. Therefore, the difference between what MBNL pays and the actual incremental cost of the backhaul circuits BT Wholesale provides is roughly £([X]*[X]) million, that is, less than £[X] million. This would not entirely translate into a cost reduction for the integrated firm compared to EE, as almost half of the backhaul costs are currently paid by H3G and not EE.
158. Currently, MBNL sources approximately [X]% of its fibre backhaul connections from Virgin Media. Even assuming that, post-merger, MBNL sourced all its fibre backhaul connections from BT Wholesale (and assuming that the price charged by Virgin Media is approximately equal to the one charged by BT Wholesale), the cost saving for EE would increase by just around [X].⁸¹ The figure would still remain quite small if compared with the overall costs that a company like EE sustains.⁸²
159. Although there are uncertainties on the exact level of efficiencies the merger would generate with respect to the provision of mobile backhaul, the analysis above suggests that such efficiencies are not so large as to translate into a reduction of retail prices that would give rise to a margin squeeze that could have a significant effect on other MNOs' competitiveness.

Vertical arithmetic on foreclosure of BT Wholesale's backhaul services at contract renewal time

160. This section presents the vertical arithmetic we have performed to determine whether the merged entity would have the incentive to withdraw supply from H3G and Telefónica when the current contracts between these MNOs and BT Wholesale are due for renewal.
161. The analysis is developed as follows:

⁸¹ EE would be sourcing approximately 25% more circuits from BT.

⁸² [X]

- (a) We first estimate the number of retail customers that the foreclosed MNOs would need to lose in order for the foreclosure strategy to be profitable.
- (b) We then estimate the increase in the variable cost of backhaul that MNOs may be expected to face if the supply of BT Wholesale's backhaul products were withdrawn.
- (c) Finally, we estimate the loss of retail customers that MNOs may expect as a result of the increase in backhaul costs.

162. It is important to note that the cost increase we are interested in is with respect to the counterfactual, not to current price levels. However, in the quantitative analysis we will use current prices as a proxy for the prices that would emerge in the counterfactual at contract renewal time.

Estimating the loss of MNOs' customers that would make foreclosure profitable

163. In order to estimate the number of retail customers that the foreclosed MNOs (and their hosted MVNOs) need to lose in order to make supply withdrawal profitable for the merged entity, the analysis proceeds through the following steps:
- (a) We estimate the loss the merged entity would incur at the wholesale level.
 - (b) We estimate the margin that would be earned by the merged entity from newly acquired retail customers; this allows us to determine the number of customers that would have to be acquired to make the foreclosure strategy profitable.
 - (c) We estimate the percentage of retail customers leaving the foreclosed MNOs that would divert to the merged entity; this allows us to compute the overall reduction in the foreclosed MNOs' number of customers that would make foreclosure profitable.

Wholesale losses

164. The following table summarises revenues, costs and variable profits expected by BT Wholesale in 2015/16 in relation to the MEAS contracts with MBNL and Telefónica.

Table 14: Expected revenues, costs and profits for BT Wholesale from MEAS in 2015/16

	<i>£m</i>	
	<i>MBNL</i>	<i>Telefónica</i>
Revenue	[X]	[X]
Openreach Circuit cell site rentals	[X]	[X]
Openreach Circuit connections/upgrades to CellSites	[X]	[X]
Cell site Service delivery costs	[X]	[X]
Backhaul to 21C Core	[X]	[X]
Backhaul across Core	[X]	[X]
Change control/Other	[X]	[X]
Total variable costs	[X]	[X]
Variable margin	[X]	[X]
Management & project management costs (fixed cost)	[X]	[X]
Depreciation (fixed cost)	[X]	[X]
Total fixed costs	[X]	[X]
EBIT	[X]	[X]

Source: BT.

Note: The entries highlighted in blue represents costs that BT Wholesale pays to Openreach.

165. In estimating the wholesale losses in the event BT Wholesale ceased to supply mobile backhaul services to H3G, we are making the following assumptions:

(a) As H3G will have to use an alternative backhaul infrastructure and given that, in large parts of the country, there is no real alternative to Openreach for the supply of terminating segments, we assume that H3G would spend on Openreach inputs an amount equal to what is currently paid by BT Wholesale. This assumption is likely to underestimate the merged entity's wholesale loss, as:

- (i) H3G may choose to substitute some Openreach circuits with Virgin Media circuits or dark fibre, or to use more microwave links;
- (ii) The current volumes of inputs are used to backhaul the traffic generated by both H3G and EE; it is likely that H3G alone would require lower volumes; and
- (iii) Alternative backhaul providers do not appear to have a lower number of points of presence compared to BT Wholesale, and would not require more Openreach inputs to connect H3G's sites; for example, Vodafone has a similar number of points of presence as BT Wholesale.⁸³

(b) The revenue BT Wholesale gets from MBNL is split in equal parts between EE and H3G.⁸⁴

⁸³ BT Wholesale has [X] fibre points of presence. [X]

⁸⁴ [X]

- (c) As H3G and EE currently share most of the backhaul infrastructure, and this will have to continue to be used to by EE, no cost can be saved by not supplying H3G.⁸⁵
- (d) Openreach's variable margin on the new inputs required by H3G is assumed at 50%.⁸⁶
166. These assumptions imply that, by not serving H3G, the merged entity would sustain a loss of revenues of £[X] million, not compensated by a reduction in BT Wholesale's costs, but would obtain a further Openreach variable margin of £[X] million. The overall loss would be £[X] million.
167. In estimating the wholesale losses in the event BT Wholesale ceased to supply mobile backhaul services to Telefónica, we are making the following assumptions:
- (a) BT Wholesale would recover all the costs, so that the loss would correspond to the expected variable margin.
- (b) Openreach would not lose any profit made on inputs leased to BT Wholesale and used to supply Telefónica, as the alternative Telefónica's supplier will still need Openreach inputs. As for the case of H3G, this assumption tends to underestimate the merged entity's wholesale loss, as:
- (i) Telefónica may choose to substitute some Openreach circuits with Virgin Media circuits or dark fibre, or to use more microwave links;
- (ii) If Telefónica experiences a reduction in the number of customer as a result of foreclosure, it may need to use a smaller amount of backhaul inputs; and
- (iii) Alternative backhaul providers do not appear to have a lower number of points of presence compared to BT Wholesale, and would not require more Openreach inputs.
168. These assumptions imply that, by not serving Telefónica, BT Wholesale would sustain a loss of £[X] million.

⁸⁵ It is possible that some costs could be saved, as lower capacity would be sufficient to backhaul EE's traffic. However, the assumption of no cost reduction is the only one consistent with the similar assumption on H3G's costs we have made above.

⁸⁶ In the [BCMR preliminary consultation on passive remedies of November 2014](#), Ofcom estimated that approximately 50% of the Openreach Ethernet leased line price was variable margin above LRIC. This variable margin covers a contribution to common costs (such as the cost of laying ducts, repair and maintenance) and a fair return on capital.

169. BT suggested that the wholesale losses so estimated might underestimate the true losses. BT considered that the loss of traffic generated by MNOs through its shared aggregated network (21CN) would increase the marginal costs of providing other backhaul and non-backhaul services, which also used 21CN. The main reason for this was related to port costs, which represented a major source of overall network costs.
170. Port costs relate to the relevant portion of the costs of installing a line card at the local access node. [✂]. The supply of mobile backhaul would, especially in more remote areas, justify installing line cards. Once a line card has been installed any remaining capacity can be used to supply non-mobile CP businesses, enterprises and government. The loss of mobile backhaul would therefore increase BT Wholesale's marginal costs in areas where it would otherwise have installed line cards associated with expansion of an MNO's network. Were a competitor to BT to increase its share of traffic generated by MNOs, this would allow it to reduce the marginal costs of providing other (non-mobile) services. This would therefore enable it to compete even more aggressively across a range of services with BT Wholesale.
171. It is difficult to estimate the impact of the loss of mobile traffic on BT Wholesale's ability to compete in other markets. BT's observation seems to imply that the impact would be significant primarily in remote areas, where opportunities for other business are likely to be limited. This suggests that the overall impact may not be large.⁸⁷ In any case, we consider there is no need to precisely estimate this effect, as our analysis suggests that, even with a potentially underestimated wholesale loss, there would be no incentive to foreclose.

Compensating retail customer acquisitions

172. We now estimate how many new retail mobile customers the merged entity should acquire to compensate for the losses sustained at wholesale level. In doing this, we assume that the proportion of post-pay and pre-pay new customers reflects the corresponding proportion in the customer population of the foreclosed MNO.
173. This assumption is consistent with the model we use for estimating the MNOs' expected customer loss (see paragraphs 191 to 207), in which we make the simplifying assumption that all customers consume the same amount of traffic. In other words, we estimate how many 'typical' customers would be

⁸⁷ The impact would in any case be only a decrease of other providers' marginal costs, and not an increase of BT's marginal costs, as the loss of current backhaul contracts would not determine the loss of the already installed line cards.

lost by the foreclosed MNOs; for consistency, we need to consider the margin that the merged entity can gain from these ‘typical’ customers. Therefore, although the foreclosed MNOs might have a higher incentive to get rid of the most data-consuming customers (which are those consuming more backhaul capacity) and the merged entity might earn higher margins from these customers, using the higher margin to compute the number of customers that the foreclosed MNOs need to lose to make foreclosure profitable would generate a figure not comparable with our estimated churn.

174. The following table shows EE’s variable retail mobile margins, and the percentages of H3G’s and Telefónica’s pre- and post-pay customers.

Table 15: Pre- and post-pay margins and customers split

	<i>Pre-pay</i>	<i>Post-pay</i>
Monthly EE variable margin (H1 2015)*	[X]	[X]
H3G (and hosted MVNOs) customers split (Q4 2014)	[X]	[X]
Telefónica (and hosted MVNOs) customers split (Q4 2014)	[X]	[X]

Source: EE ([X]) and Ofcom ([X]).

*EE considers that the correct measure of long-run variable margins should include the proportion of depreciation that is avoidable in the long run incremental cost. This approach would reduce the margins to £[X] for prepay customers and £[X] for post-pay customers. Adopting these values would make total foreclosure less profitable.

175. In our estimation, we increase the average margins implied by the data in Table 15 by 20%, to compensate for
- (a) The additional margin that the merged entity may earn by cross-selling fixed products to the captured mobile customers;
 - (b) The higher margin the merged entity would gain for captured business customers.
176. On the other hand, we note the existence of other arguments that would tend to reduce the average margin. For example, some of the customers diverting to EE’s network may divert not to EE directly, but to one of its hosted MVNOs. In this case, the merged entity would earn a lower average margin.
177. Using the figures in Table 15 and increasing the result by 20%, the expected variable margin the merged entity would gain from a customer switching from H3G or one of its hosted MVNOs can be estimated at £[X] per month, or £[X] per year. Similarly, the expected variable margin from a customer switching from Telefónica or one of its hosted MVNOs is estimated at £[X] per month, or £[X] per year.
178. This implies that withdrawing supply to H3G would be profitable as long as at least approximately [X] H3G customers switched to the merged entity. Withdrawing supply to Telefónica would be profitable if the captured retail customers were at least around [X].

Required loss of retail customers from foreclosed MNOs

179. In order for the above number of retail customers to switch to the merged entity, the foreclosed MNOs must lose a larger number, as not all of the lost customers can be expected to switch to the merged entity. In order to estimate the necessary churn for the foreclosed MNOs, we make the following assumptions:
- (a) There is positive diversion only towards non-foreclosed MNOs, that is, the merged entity and Vodafone.
 - (b) Diversion ratios will be proportional to the current customer ratios of the non-foreclosed MNOs.
 - (c) No retail customer exits the market as a result of the increase in retail prices.
180. In the last quarter of 2014, EE and the MVNOs hosted on its network had approximately [X] mobile customers, while Vodafone and its MVNOs had [X]. Given these numbers, we assume that the merged entity would capture [X]% of the customers lost by the foreclosed MNOs.⁸⁸ This implies that, for supply withdrawal to be profitable, it should lead to H3G losing at least [X] retail customers, corresponding to [X]% of its and its MVNOs' customer base at the end of 2014, and to Telefónica losing at least [X] customers, or [X]% of its and its MVNOs' customer base at the end of 2014.

Caveats

181. The analysis above is subject to several simplifying assumptions. In addition to those already noted above, the following points should also be kept in mind:
- (a) The estimates are based on the current cost of backhaul. As seen in paragraph 87, some MNOs expect backhaul costs to increase in the future. Other things being equal, this would increase the wholesale loss the merged entity would have to sustain if foreclosing rival MNOs and make foreclosure less likely.
 - (b) Retail revenues may also increase in the future, as more customers move from pre-pay contracts to more expensive post-pay contracts; this would increase the retail margins and make foreclosure more profitable.

⁸⁸ The proportion does not change significantly if MVNOs' customers are excluded.

- (c) In general, it is difficult to predict how the mobile industry will look when the current backhaul contracts between the MNOs and BT Wholesale will have to be renewed; the relative strength and size of the different MNOs might have changed, while advances in fixed-mobile convergence may change the margins that can be gained from mobile customers.

Estimating the increase in variable backhaul costs

182. In this section, we estimate the increase in the variable cost of backhaul that may be expected in the event of foreclosure. We focus on the variable component as we expect that any increase is more likely to be passed through to consumers in the form of higher retail prices than an increase in fixed costs.
183. Telefónica told the CMA that £[redacted] could be an initial estimate of the capital investment and parallel running in the case of it had to switch from BT Wholesale. In addition to this cost, Telefónica expected a further investment of £[redacted] due to the need to reconnect numerous access circuits following from a reduction in the number of points of presence of an alternative aggregation network. Finally, Telefónica expected an increase by more than £[redacted] per year in the cost of access circuits, due to the lower number of points of presence.
184. In relation to these costs, we note that the initial capital investment is likely to be a fixed cost, which will have to be incurred independently of the volume of traffic on Telefónica's network, and is therefore less likely to have an impact on Telefónica's retail prices. Parallel running costs are also likely to be mostly fixed.⁸⁹ It is, moreover, not obvious to us that an alternative aggregation network would necessarily have a lower number of points of presence. We note, for example, that [redacted]. The actual increase in variable backhaul costs may therefore be much lower than the figures estimated by Telefónica.
185. On the other hand, the presence of high fixed costs to switch backhaul provider may give BT Wholesale the ability to offer an MNO a new contract with higher variable costs, such as higher costs for circuit upgrades.⁹⁰ The MNO may be willing to accept higher variable costs in order to avoid the high fixed costs. It is, however, difficult to determine how much this strategy could be successful. In fact, given the large expected increase in mobile data traffic (see paragraph 84(a)) and the uncertainties around this growth, MNOs may

⁸⁹ Parallel running costs could be variable if an MNO is forced to implement network upgrading first with the legacy provider and then with the new one. However, MNOs would have an incentive to move to a new provider starting exactly from those circuits that need to be upgraded (see H3G RTIR 29.07.15, question 5), so that such occurrences are likely to be rare.

⁹⁰ For the incentive to be merger-specific, higher variable costs must be accompanied by lower fixed costs or a reduction in volumes, such that the total wholesale profits for BT Wholesale do not increase.

be unwilling to accept significant increases in variable costs. In this regard, we note that the interest expressed by MNOs in dark fibre is partly motivated by the desire of uncoupling backhaul costs and traffic volumes.

186. H3G has provided its rough estimates of the costs of replacing BT Wholesale provision of backhaul services with a new solution, on a unilateral basis, considering a number of different scenarios. The figures in Table 16 below are based on several assumptions. In particular, [REDACTED].

Table 16: H3G's estimated costs of replacing BT's backhaul

Scenario	£m			
	10-year opex	Capex	Other services: plan/deploy/operate	Total cost of ownership over 10 years
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]

Source: H3G.

187. As in the case of Telefónica, most of these costs are likely to be fixed. Estimating by how much variable cost would increase compared with the counterfactual is not clear-cut; we have adopted the following approach:
- From Table 16, we take £[REDACTED] million as the approximate yearly cost of backhaul when BT Wholesale is not an available provider and when costs are not shared with EE.
 - From a comparison with Table 2, we note that this corresponds to an increase of approximately £[REDACTED] million compared to backhaul costs in 2014. We exclude the costs of self-supply in Table 2, as they are not included in Table 16 either.
 - Comparing the total backhaul costs for H3G in Table 2 with the estimated variable costs in paragraph 93, we estimate that [REDACTED]% of backhaul costs are variable.
 - We then estimate that the increase in variable backhaul costs is approximately [REDACTED]% of the total cost increase in point (b), ie £[REDACTED] million.
188. The estimation above is subject to several simplifying assumptions. In particular:
- We compare the expected average cost in case of foreclosure, with backhaul costs in 2014; however, 2014 costs may be different from future backhaul costs in the counterfactual, although the direction of change is not clear (see paragraphs 84 to 87).

(b) The estimate of variable costs for 2014 is based on expected backhaul investments in the following three years (see paragraphs 89 to 93). What proportion of costs can be considered variable depends on how backhaul investments are expected to evolve in response to increases in demand. The investment schedule for 2015 to 2017 may not be representative of what will have to be invested in the future.

(c) The values from Table 16 include the initial investments needed to switch providers, which should be considered entirely fixed; [X]% may be an overestimate of the variable component. Moreover, alternative backhaul providers may offer solutions with lower variable costs than BT Wholesale, especially if these are based on dark fibre.

189. Given the assumptions underlying H3G's estimates and the simplifications on which our estimation of variable cost increases is based, the estimate obtained should not be considered precise. We nonetheless consider that, given the caveats in paragraph 188(c), variable cost increase is unlikely to be much higher. In the rest of the analysis, we will therefore consider an increase in yearly variable backhaul costs of £[X] million, which we consider a reasonable upper bound.⁹¹

190. We consider that this figure may be appropriate also in the case of Telefónica. Compared with H3G, Telefónica [X]; this would tend to increase the impact of foreclosure. On the other hand, H3G is currently sourcing backhaul jointly with EE, so that its costs would further increase post-merger by the necessity of sourcing backhaul unilaterally.

Estimating the expected decrease in MNOs' number of customers

191. How MNOs would change retail prices following an increase in the cost of backhaul and how their customers would respond depend on the characteristic of the demand MNOs face. We have therefore performed the same analysis using first a linear demand function, then an isoelastic demand function. Both linear and isoelastic demand functions represent simplified models and the 'true' demand functions are likely to be somewhere between these two cases.

Variable costs and price elasticity of demand

192. Our analysis is based on a simple model in which each MNO sells a single retail product and faces a single demand function. We make the simplifying

⁹¹ We have nevertheless run the analysis also for values above this, as a sensitivity check.

assumption that marginal costs are constant, so that marginal costs equal variable costs. Finally, we assume that MNOs are currently maximising their profits, which implies that current variable margins are related to the price elasticity of the demand faced by MNOs by the following relation:

$$margin = \frac{\hat{R} - \hat{C}}{\hat{R}} = \frac{\hat{p} - \hat{c}}{\hat{p}} = \frac{1}{\hat{\varepsilon}}$$

where \hat{R} is the current level of revenues, \hat{C} the current level of variable costs, \hat{p} the current price level, \hat{c} the current level of variable costs per customers, and $\hat{\varepsilon}$ the (absolute value of) the price elasticity of demand at current prices.^{92,93}

193. Using this relationship, we can estimate the price elasticity of demand from data on the revenues and variable costs of the MNOs. H3G has provided estimates of their revenues and variable costs in 2014. Note that variable costs include variable backhaul costs, following the methodology described in paragraphs 89 to 93.

Table 17: H3G’s retail revenues, variable costs and customers in 2014

Retail revenues	[X]
Variable costs	[X]
Total customers	[X]

Source: H3G.

194. These values imply a price elasticity of approximately [X]. This constitutes our base case for the vertical arithmetic analysis. We also consider a range of values (approximately between 2 and 4) as a sensitivity test (see paragraph 200).

Linear demand

195. We first consider a demand function of the form

$$Q = K - h * p$$

where Q is the number of retail customers and p the yearly price of retail mobile services. Using the current values for retail revenues (\hat{R}) and number

⁹² This step is what differentiates our analysis from that submitted by CompassLexecon (see Theory of Harm 4: Input foreclosure in mobile backhaul services, 26 August 2015). In CompassLexecon’s analysis, the current margins are not linked to the current elasticity of demand. For the parameter values chosen by CompassLexecon, the initial margin is much higher than what would be implied by profit maximisation, with the result that any pass-through of a small increase in variable costs becomes unprofitable. In that model, therefore, cost increases are not passed-through and there is no effect on consumers.

⁹³ The elasticity implied by this formula is a firm elasticity. In a scenario in which multiple MNOs (and their hosted MVNOs) are simultaneously foreclosed, the relevant elasticity would be between the firm elasticity and the (lower) industry elasticity.

of customers (\hat{Q}), and the elasticity of demand $\hat{\varepsilon}$ estimated as in paragraph 192, we can estimate the parameters of the demand function (ie its slope h and intercept K).

196. Using the definition of price elasticity, and defining $\hat{p} = \hat{R}/\hat{Q}$,

$$\hat{\varepsilon} = -\frac{dQ}{dp} \frac{\hat{p}}{\hat{Q}} = h \frac{\hat{p}}{\hat{Q}} \Rightarrow h = \hat{\varepsilon} \frac{\hat{Q}}{\hat{p}}$$

$$\hat{Q} = K - h * \hat{p} \Rightarrow K = \hat{Q} + h * \hat{p}$$

197. With the demand parameters so estimated, we can then find the price level that maximises the firm's profits for a given increase in per-customer marginal costs Δc , by solving

$$\max_p (K - h * p)(p - \hat{c} - \Delta c)$$

198. The solution is given by

$$p^* = \frac{h * (\hat{c} + \Delta c) + K}{2 * h}$$

199. The new price p^* can then be used to estimate demand after the cost increase.⁹⁴ The analysis can be repeated for different values of \hat{c} and Δc . As shown in paragraph 192, different values of \hat{c} correspond to different values of $\hat{\varepsilon}$.

Results for H3G

200. Table 18 below shows the results of this analysis when using data on revenues and costs provided by H3G. In the base case, initial variable costs are as in Table 17 above, and variable cost increase is £[~~xxx~~] million (at current customer numbers). We have performed a sensitivity analysis using values for variable costs between 80% and 120% of the figure provided by H3G, and variable cost increases between 50% and 150% of our base estimate.
201. These figures should be compared with the critical value for customer loss that would make withdrawal of supply profitable. This was estimated in paragraph 180 at [~~xxx~~]. In all scenarios within our sensitivity analysis, H3G's customer loss is significantly smaller than [~~xxx~~].

⁹⁴ The expression for p^* implies a pass-through of $\frac{1}{2}$, which is always the case with a linear demand function.

Results for Telefónica

202. Table 19 presents the same analysis in relation to Telefónica. As we do not have data on Telefónica's variable costs, we have assumed in our base case that the elasticity of demand is the same as that estimated for H3G. The figures in the table represent the expected loss of Telefónica's own retail customers.
203. In paragraph 180, we estimated the critical value for customer loss that would make withdrawal of supply profitable at [REDACTED]. However, unlike the case of H3G, the MVNOs hosted by Telefónica have a significant number of mobile customers, approximately equal to [REDACTED]% of Telefónica's own retail customer base.⁹⁵ If we think that a backhaul cost increase would have similar effects on the MVNOs as on the hosting MNO, then we must correspondingly adjust the critical value to which the figures in the table should be compared.⁹⁶ In this case, the critical churn of Telefónica's retail customers is approximately [REDACTED].⁹⁷ This is the value to which the figures in Table 19 should be compared. In all scenarios within our sensitivity analysis, Telefónica's customer loss is significantly below the critical churn.

Isoelastic demand

204. As an alternative, we now assume that the MNOs' face an isoelastic demand, of the form

$$Q = K * p^{-\varepsilon}$$

where ε is the (absolute value of) price elasticity of demand. In this case, elasticity is constant and equal to the value $\hat{\varepsilon}$ estimated above; the multiplicative parameter K is then determined from the following equation:

$$\hat{Q} = K * \hat{p}^{-\hat{\varepsilon}} \Rightarrow K = \hat{Q} * \hat{p}^{\hat{\varepsilon}}$$

205. With the demand parameters so estimated, we can then find the price level that maximises the firm's profits for a given increase in per-customer marginal costs Δc , by solving

$$\max_p (K * p^{-\hat{\varepsilon}})(p - \hat{c} - \Delta c)$$

⁹⁵ Ofcom.

⁹⁶ Such an adjustment does not take into consideration the possible differences in the elasticity of demand faced by Telefónica and its hosted MVNOs. In view of the considerations in paragraph 16.6, assuming that MVNOs are foreclosed to the same extent as the MNOs is a conservative assumption, which tends to increase the profitability of a foreclosure strategy.

⁹⁷ That is, 550,000 divided by 1.3.

206. The solution is given by

$$p^* = (\hat{c} + \Delta c) \frac{\hat{\varepsilon}}{\hat{\varepsilon} - 1}$$

207. The new price p^* can then be used to estimate demand after the cost increase.⁹⁸ As in the previous case, the analysis can be repeated for different values of \hat{c} and Δc .

Results

208. Table 20 below shows the results of this analysis when using data on revenues and costs provided by H3G and performing the same sensitivity analysis as in the linear case (see paragraph 200). Table 21 presents the same analysis for Telefónica; the same caveat as in paragraph 202 applies. The figures in Table 20 and Table 21 should be compared to critical values of $[\chi]$ and $[\chi]$ respectively.

209. In the case of Telefónica, the expected customer loss under our base case is approximately equal to the critical value, while it is 12% higher for H3G. However, we note that isoelastic demand tend to overestimate cost pass-through, which is assumed to be higher than 100%. Moreover,

(a) the assumptions we have made when estimating the critical churn (see paragraphs 165 and 167) are overall biased towards leading to an excessively low value;

(b) the estimated variable backhaul costs increase may be significantly higher than the most likely value (see paragraph 189).

210. As, even under these somewhat extreme assumptions, the expected customer churn is only slightly higher than the critical value, we considered that the likelihood of the merged entity having an incentive to withdraw supply of managed backhaul was low.

⁹⁸ The expression for p^* implies a pass-through of $\hat{\varepsilon}/(\hat{\varepsilon} - 1)$, which is higher than 1, as is always the case with isoelastic demand.

Table 18: Estimated loss of retail mobile customers for H3G under linear demand

			Variable costs								
			80%	85%	90%	95%	Base case	105%	110%	115%	120%
			Price elasticity								
			[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]
Variable cost increase	50%	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]
	60%	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]
	70%	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]
	80%	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]
	90%	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]
	Base case	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]
	110%	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]
	120%	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]
	130%	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]
	140%	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]
150%	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	
Demand function parameters	Slope (h)		[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]
	Intercept (K)		[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]

Source: CMA calculations.

Table 19: Estimated loss of retail mobile customers for Telefónica under linear demand

			Variable costs								
			80%	85%	90%	95%	Base case	105%	110%	115%	120%
			Price elasticity								
			[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]
Variable cost increase	50%	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]
	60%	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]
	70%	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]
	80%	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]
	90%	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]
	Base case	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]
	110%	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]
	120%	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]
	130%	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]
	140%	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]
	150%	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]
Demand function parameters	Slope (h)	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]
	Intercept (K)	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]

Source: CMA calculations.

Table 20: Estimated loss of retail mobile customers for H3G under isoelastic demand

			Variable costs								
			80%	85%	90%	95%	Base case	105%	110%	115%	120%
			Price elasticity								
			[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]
Variable cost increase	50%	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]
	60%	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]
	70%	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]
	80%	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]
	90%	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]
	Base case	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]
	110%	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]
	120%	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]
	130%	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]
	140%	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]
	150%	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]
	Demand function parameters	Elasticity (ϵ)	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]
Multiplicative parameter (K)		[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]

Source: CMA calculations.

Table 21: Estimated loss of retail mobile customers for Telefónica under isoelastic demand

		Variable costs									
		80%	85%	90%	95%	Base case	105%	110%	115%	120%	
		Price elasticity									
		[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	
Variable cost increase	50%	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	
	60%	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	
	70%	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	
	80%	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	
	90%	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	
	Base case	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	
	110%	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	
	120%	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	
	130%	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	
	140%	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	
	150%	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	
Demand function parameters	Elasticity (ϵ)	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	
	Multiplicative parameter (K)	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	[X]	

Source: CMA calculations.

Retail fixed broadband: Market A

1. This appendix provides supplementary information to support the analysis in Chapters 19 and 20.

Nature of competition

Product differentiation

2. Sky, noting that BT's competitors (other than Virgin Media) use BT's Generic GEA service to provide retail customers with a competing fibre broadband service, said that there is currently little prospect of other operators being able to do anything other than re-selling this product, thus limiting the scope for retail differentiation. It submitted that while a more upstream passive physical infrastructure access product (which enables access to BT's ducts and poles to enable CPs to lay their own fibre) is available from Openreach, it is characterised by a number of practical limitations that do not enable it to be used by CPs to deploy their own fibre as an effective alternative to GEA at scale.
3. Other product differentiation features are data allowances provided as an inclusive part of the broadband package purchased. Most of the large CPs provide an unlimited data allowance as part of their standard package with the exception of Sky, BT and Plusnet where both capped and unlimited data allowances are available.¹ While the main CPs provide several options for inclusive call packages (inclusive weekend calls, off-peak calls etc) as part of their standard fixed broadband and fixed line packages there is similarity in these options across providers.²

Bundling

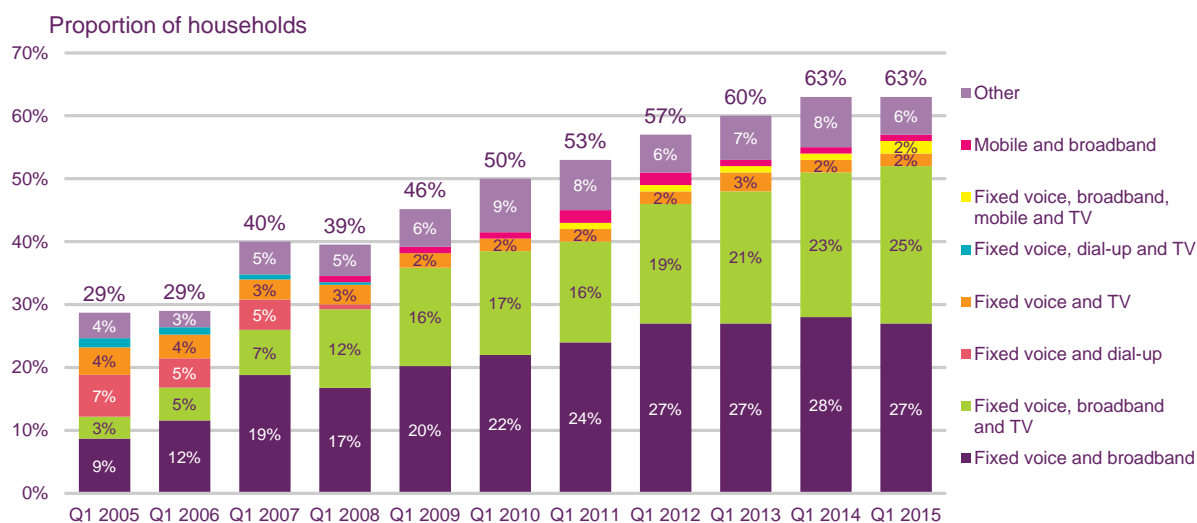
4. For the purposes of this paper, we take each provider's fixed broadband product and fixed voice ('dual-play') as the main point of comparison particularly as all the CPs offer this package (including BT, Plusnet and EE).

¹ Additional per-unit charges apply for data consumed in excess of the capped allowance. For Plusnet, currently both capped and unlimited data allowances are available for business customers, and only unlimited data is available for residential customers.

² Ofcom (August 2014), [CMR 2014](#), Figure 26.9: Comparison of major ISPs' superfast and current generation broadband services.

For more detail on fixed-mobile ('quad-play') packages, see Appendix H: fixed-mobile bundles.

Figure 1: Take-up of bundled services



Source: Ofcom Technology Tracker. Data from Quarter 1 of each year 2005-2013, then Wave 1 2014-2015. Note: Base – all adults aged 16+ (2015 n=3756). Question: QG1. Do you receive more than one of these services as part of an overall deal or package from the same supplier?

Regulation

- Ofcom requires BT Openreach to provide wholesale local access (WLA) services on regulated terms. This covers LLU for copper-based CGA services, and VULA for fibre-based NGA services. This allows other CPs to use BT's access network that connects a customer's premises to the local telephone exchange and therefore provides competing retail voice and broadband services. In LLU the CP takes over (in whole or in part) BT's copper lines between the customer and the local exchange and the CP is given access to the exchange to install its own equipment to connect the customer to the provider's own network. VULA allows competitors to deliver services over BT's NGA network, with a degree of control that is similar to that achieved when taking over the physical line to the customer.
- These WLA products must be provided by BT Openreach on an equivalence-of-inputs (EOI) basis. LLU products are subject to charge-control³ and BT's retail SFBB bundles must comply with the VULA margin test. The VULA margin test means that BT must maintain a minimum margin between the wholesale price of VULA and the average retail price of broadband packages that use VULA as an input.⁴ The purpose of this obligation is to ensure that

³ Ofcom, [Regulated Prices](#).

⁴ Weighted according to actual sales of packages (including those of its Plusnet brand).

BT cannot use its SMP in the WLA market to set the VULA margin such that it causes retail competition in superfast broadband to be distorted.

7. CPs that operate in the upstream market may resell their product to other downstream players (such as EE, who buys from BT, or the [X]).⁵
8. Take-up of WLA has been low in some areas. This is largely in rural areas where WLA remedies are less viable due to the limited number of premises in the area, which reduces CPs' opportunities to recover the costs of installing LLU equipment.⁶ In such areas, Ofcom imposes regulation further down the supply chain in Market A where the end-to-end managed WBA products sold by BT (Openreach) is subject to Ofcom regulation. In Market A, Ofcom found BT has SMP⁷ and requires BT to adhere to general access, non-discrimination and transparency obligations as well as a charge control requirement. The aim of the general access and non-discrimination obligations is to ensure that other CPs have the opportunity to use wholesale products supplied by BT on an EOI basis and thus prevent BT discriminating in favour of its own retail divisions. The various transparency obligations are designed to provide third parties with access to information necessary to make informed decisions about purchasing BT's wholesale products and allow Ofcom and other stakeholders to monitor adherence to and the effectiveness of the obligations.
9. In Market A, BT is also subject to a charge control at a level of CPI-10.7% in order to restrict BT's ability to charge excessive prices to CPs and ensure that the price of BT wholesale products are cost-reflective.⁸
10. Ofcom also imposes regulation for Wholesale Line Rental (WLR). WLR enables CPs to offer fixed voice services to consumers using lines rented from Openreach.

Competition in Market A

11. For 5.2% of UK premises, no CP has unbundled the local exchange. Within these areas, the scope for product differentiation is more limited as retail operators buy wholesale broadband products from BT Wholesale and resell

⁵ This intermediate market is referred to as the WBA market.

⁶ [Ofcom initial submission](#), paragraph 6.6.

⁷ [Ofcom 2014 WBS market review, final statement](#).

⁸ [Ofcom 2014 WBA market review, final statement](#), paragraphs 1.8–1.9 & section 6. The general access, non-discrimination and transparency obligations are also imposed on KCOM in the Hull Area where Ofcom found it has SMP.

them to retail customers. In Market A, BT's wholesale product is regulated and subject to charge control.

12. BT has a high retail market share within these areas ([REDACTED]).⁹ In Market A, BT's largest competitor is [REDACTED], which has the large majority of unbundled exchanges in Market A2. In Market A1 off-net the two competitors with the largest share of customers, substantially behind BT, are [REDACTED]. TalkTalk is no longer active in its off-net areas, having sold its entire off-net customer base to Fleur Telecom in March 2015, and Virgin Media's fibre network is mainly concentrated outside of Market A.¹⁰
13. Although EE has a small share in the UK (up to 4%)¹¹ and in Market A ([REDACTED]%),¹² EE is present at the retail level in some areas where only one PO (BT) is present with its own network (ie Market A1) and there are only a small number of operators reselling BT Wholesale's product.
14. The main parties consider that EE is not currently [REDACTED]. They say this is true of both BT branded broadband products and BT's Plusnet brand. [REDACTED]¹³

Market shares

15. In this section, we analyse evidence on CP market presence by area.

Number of principal operators by exchange

16. Table 1 shows for September 2013 (the date of the latest available Ofcom figures) the number of exchanges and their coverage of UK premises according to how many CPs have unbundled the local exchange. Taking account of committed and planned LLU roll-out, it can be seen that there are 2,508 exchanges where no unbundling has taken place ('BT-only'), which together have a coverage of 5.2% of UK premises. In a further 662 exchanges, one operator other than BT has unbundled the exchange ('BT +1'). Together, this means that 9.6% of UK premises fell within Ofcom's definition of Market A. The extent of planned further LLU roll-out suggests that the number of LLU exchanges will not have changed materially since September 2013 for the purposes of this merger inquiry and we do not intend to update these figures.

⁹ A1 denotes areas where no POs other than BT have unbundled the exchange, and A2 represents all other areas in Market A (ie 2 POs present). [REDACTED]

¹⁰ Virgin Media had an estimated [REDACTED]% market share in December 2014. It subsequently sold its off-net residential customer base to TalkTalk, so the market share may have decreased further since then.

¹¹ Data for Q1 2015, source [Enders Analysis RTIR](#).

¹² Estimated market share figures for December 2014.

¹³ See the [BT/EE response to the issues statement](#).

Table 1: Number of exchanges and UK coverage for exchanges grouped by number of POs present (excluding the Hull Area), September 2013

Number of POs present	Taking account of current position plus 'Committed' planned LLU roll-out		Taking account of current position plus both 'Committed' and 'Uncommitted' planned LLU roll-out	
	Number of exchanges	Coverage of UK premises (%)	Number of exchanges	Coverage of UK premises (%)
BT-only	2508	5.20	2393	4.82
BT + 1	662	4.39	771	4.69
BT + 2	1124	20.11	1130	20.18
BT + 3	721	33.65	721	33.65
BT + 4	545	36.64	545	36.64

Source: Ofcom (2014), [Review of the wholesale broadband access markets](#), Annex 6, Table A6.4.
 Note: Ofcom intends to update this table in autumn 2015 in preparation for its 2017 WBA review.

Network reach of principal operators

17. Table 2 shows the network and LLU coverage of Market A by PO in September 2013. Other than BT, the main CP with significant network coverage of Market A premises is TalkTalk, and even then the coverage is only of 45% of premises. All other POs have a small network footprint.¹⁴ This suggests that there remain significant further costs that would need to be incurred by operators other than BT to provide comprehensive coverage across Market A.

Table 2: Network and LLU cover of Market A premises by PO, September 2013

Operator	Market A coverage (%)
BT	100
Sky	[0–10]
TalkTalk	44.8
Virgin Media	[0–10]
Vodafone	~1

Source: Ofcom 2014 [Review of the wholesale broadband access markets final statement](#), Table 5.3.

Market shares

Retail market shares for UK, Market A, Market B

18. Table 3 shows the estimated market shares of the largest suppliers of retail fixed broadband for Market A and Market B in December 2014. The market share at UK level for BT is 32% and EE is up to 4%.¹⁵ While BT's market share in Market A is [✂], the incremental impact of EE is still small [✂].

¹⁴ We note that the combined network reach of POs other than BT means that exchanges where only BT is present (no other PO is present either through its network or through LLU) amounts to only 5.2% of UK premises.

¹⁵ Figures for [Q1 2015, Enders Analysis](#).

Table 3: Estimated market shares for retail fixed broadband, December 2014

[REDACTED]

Source: [REDACTED]

[REDACTED]

19. Regarding differences between residential and business segments, [REDACTED].
20. We looked at shares of supply separately for the copper network and the fibre network and find that it is likely that EE has a small share of supply for SBB and SFBB products in both Market A1 and A2.¹⁶ Table 4 shows the estimated shares of supply for the copper network separately for Market A1 (where no other PO has unbundled the exchange) and Market A2 (where BT plus one other CP has unbundled the exchange). This table shows that EE's share is small ([REDACTED]% in March 2015) for both Market A1 and Market A and has been [REDACTED] over the period September 2013 to March 2015. This does not take account of Virgin Media, but this is not thought to significantly affect the results given the low network coverage of Virgin Media within Market A.
21. Table 5 shows the estimated shares of supply for the fibre network separately for Market A1 (where no other PO has unbundled the exchange) and Market A2 (where BT plus one other CP has unbundled the exchange). This table shows that EE share is small [REDACTED]. We note that EE's share of the fibre network [REDACTED] over the period September 2013 to March 2015. The share of other CPs has [REDACTED] in Market A1 and from [REDACTED] in Market A2 over the same period. Again, this does not take account of Virgin Media, but this is not thought to significantly affect the results given the low network coverage of Virgin Media within Market A.¹⁷ We note that as of March 2015, the proportion of exchanges with fibre customers was [REDACTED]% for Market A2 and [REDACTED]% for Market A1.¹⁸

Table 4: Retail copper share of supply (excluding cable)

[REDACTED]

Table 5: Retail fibre share of supply (excluding cable)

[REDACTED]

Source: [REDACTED]

[REDACTED]

¹⁶ As set out previously in the 'Background' section, the actual speed achieved on a product delivered through a fibre network could be lower than 30 Mbit/s (ie fall outside Ofcom's definition for SFBB).

¹⁷ The fibre shares of supply give an indication of shares for superfast broadband but as noted previously, not all fibre broadband connections are capable of providing SFBB services (ie actual speeds of 30 Mbit/s or higher).

¹⁸ [REDACTED]

Exchange-level analysis of exchanges where EE share higher than average

22. There are a small number of exchanges where both EE and BT have significant market share of premises served by that exchange with limited other competitors present. These exchanges have a very small ([X]%) coverage of UK premises for both SBB and SFBB.
23. For copper, in the 2,506 exchanges in Market A1, we find that in most exchanges the share of EE is similar or less than its national share (ie the incremental contribution of EE's share is under 4%). This may overstate EE's share as the analysis does not take account of Virgin Media's cable network, though this is thought to have an immaterial impact. For copper, we note the following:
- EE's share is 4% or more in only [X] A1 exchanges (see Figure 2), with the number of premises covered by those exchanges equating to around [X]% of UK premises. Of these, in only [X] exchanges EE has its highest shares of supply (where shares of [X] were observed). The number of premises covered by these exchanges where EE's share is [X] is [X]% of UK premises.
 - In most of the [X] A1 exchanges where EE's share is 4% or more, the combined share of BT and EE is [X]% or more (see Figure 3). Of these, in [X] exchanges the combined share is [X]% or more. The number of premises served by these exchanges represents 0.5% of UK premises. Only [X] exchange has a combined share of [X]% or more.
 - Market A2 has a lower proportion of exchanges than Market A1 where the combined BT and EE share is relatively high (greater than the average ([X]%) for Market A).

Figure 2: Distribution of EE share of supply (copper) in Market A1, March 2015

[X]

Source: [X]
Notes: [X]

Figure 3: Distribution of combined BT and EE share of supply (copper) in Market A1, March 2015*

[X]

Source: [X]
[X]

24. For fibre, in the [X] exchanges in Market A1 where only BT is present, in most exchanges the share of EE is similar or less than its national share (ie the incremental contribution of EE's share is under 4%). This overstates

EE's share as the analysis does not take account of Virgin Media's cable network, though it seems unlikely that this would have a material impact. For fibre, we note the following:

- EE's share is 4% or more in [redacted] A1 exchanges (see Figure 4), with the number of premises served by those exchanges representing around [redacted]% of UK premises. Of these, in [redacted] exchanges EE has its highest shares of supply (where shares of [redacted]% or more are observed) which only covers [redacted]% of UK premises.¹⁹
- For around [redacted] of the [redacted] A1 exchanges where EE's share is 4% or more, the combined share of BT and EE is between [redacted]% and [redacted]% ([redacted] exchanges which together serve [redacted]% of UK premises). For a further [redacted] exchanges the combined share is [redacted]% or more, which together cover [redacted]% of UK premises. Figure 5 provides further details.

Figure 4: Distribution of EE share of supply (fibre) in Market A1, March 2015

[redacted]

Source: [redacted]
[redacted]

Figure 5: Distribution of combined BT and EE share of supply (fibre) in Market A1, March 2015*

[redacted]

Source: [redacted]
[redacted]

Pricing

25. In this section we analyse the relative pricing of BT, Plusnet, EE and other competitors in order to determine whether EE is likely to exert a competitive constraint on BT brands absent the merger in Market A.
26. For standard broadband, in their on-net areas within Market A, the pricing for Sky and TalkTalk are the same as elsewhere in the UK. In its off-net areas Sky offers standard broadband, but as set out previously, TalkTalk no longer offers an off-net service.
27. For SFBB, EE offers fibre where BT has rolled out fibre. Fibre is not offered to Sky off-net customers, and for on-net areas, is offered only where BT has rolled out fibre. Fibre is not offered to TalkTalk off-net customers, and for on-net areas, is offered only where BT has rolled out fibre.

¹⁹ [redacted]

28. In this section, we first look at the relative pricing levels for standard broadband and we then look at pricing for SFBB.

Standard broadband

29. For broadband and phone packages, Table 1 in Annex 1 provides a ranking of the residential fixed broadband options offered by the largest CPs outside Market A in February 2015. Comparing the average monthly charge of the lowest cost options shows that Plusnet was the cheapest, followed in increasing cost order by Sky, TalkTalk, EE and BT.
30. This provides a snapshot for a particular point in time taking account of available promotions. Other evidence looking at the lowest cost options for residential fixed broadband (but not taking account of activation charges and promotions) for April 2014, March 2013, March 2012 and June 2011 indicates that Plusnet is among the cheapest and BT is among the most expensive options, see Annex 1, Table 1.²⁰ The relative ranking of EE varies; however, the average monthly cost never situates EE as the cheapest or second cheapest option. EE is always more expensive than Plusnet and is cheaper than BT across the four dates considered, with the exception of April 2014 where BT is cheaper than EE.²¹
31. Table 6 sets out for standard broadband, the additional costs that customers in Market A are charged relative to other areas for a selection of the main CPs. We note that EE has a £15 surcharge across the whole of Market A, which is higher than that charged by other competitors irrespective of whether the area is on-net or off-net for them; and is the only one to charge a connection surcharge. It is likely that EE's retail price in both Market A1 and Market A2 for standard broadband is higher than most of its largest competitors for comparable products.

²⁰ CMA analysis of [Ofcom CMR 2014](#), p356; [Ofcom CMR 2013](#), p366; [Ofcom CMR 2012](#), p341; [Ofcom CMR 2011](#), p312. Plusnet was the cheapest for all dates except April 2014, where TalkTalk was the cheapest and Plusnet was the second cheapest. BT is the most expensive among the large CPs considered for all dates, except for April 2014, when Virgin Media was the most expensive and EE was the second most expensive. All tariffs are the lowest price available; however, a number of features may vary, including contract length, call allowances, and availability of TV channels. Figures may include line rental, IPTV and mobile services.

²¹ Orange is used as the reference point for EE for March 2012 and June 2014.

Table 6: Standard broadband: additional costs for customers in Market A relative to other areas

CP	Customer type	Market A 'surcharge' (£/month)	Additional connection costs (£)	Other restrictions specific to Market A
BT	Domestic	0	0	Only SBB available except for areas where BT has rolled out fibre
BT	Business	3 for copper (ADSL)		Only SBB available except for areas where BT has rolled out fibre
Plusnet	Domestic	7.5 in Market A1*, otherwise 0	0	Only SBB available except for areas where BT has rolled out fibre
Plusnet	Business	5 (excluding VAT) in Market A1*, otherwise 0	0	Only SBB available except for areas where BT has rolled out fibre
EE	Domestic	15	30	20GB per month cap compared to unlimited in other areas. Only SBB available except for areas where BT has rolled out fibre.
EE	Small business (1-49 employees)	20	0	Only SBB available except for areas where BT has rolled out fibre.
EE	Corporate (50 or more employees)	15 for only broadband. 20 for broadband and line rental.	0	Only SBB available except for areas where BT has rolled out fibre.
Sky	Domestic	7 at non-LLU exchanges, otherwise 0	30	At non-LLU exchanges only SBB (Sky Broadband connect) available with download speed of 6 Mbit/s. This compares with the Sky on-net product (Sky Broadband Unlimited) with 17 Mbit/s speed. Fibre is not offered to Sky off-net customers.
TalkTalk	Domestic/business	0 for network/LLU areas, otherwise it no longer sells to off-net customers	0	No retail products offered in off-net areas
Post Office	Domestic/business	0	0	Only SBB available except for areas where BT has rolled out fibre
SSE	Domestic / business	0	0	Only SBB available except for areas where BT has rolled out fibre

Source: Parties and third parties

*[redacted] Additionally, where Plusnet periodically runs 'free' offers (eg free broadband for 12 months), these offers commonly cover all market areas. Therefore there is no market price premium for the period of the offer.

Notes:

1. Generally fibre not available in market A and for EE customers, TV is only available to residential fibre customers. TV is not available to business customers in any area in the UK.
2. For BT, EE, Sky, SSE and the Post Office the surcharge describes the current position as at September 2015. For Plusnet, data is based on analysis for June 2014 to June 2015 for domestic and July 2014 to June 2015 for business.

32. EE reported to us that its [redacted]. We note that this applies to EE's standard broadband service only.²²

Non-price factors affecting the degree of competitive constraint that EE poses

33. With regard to the quality of service, Ofcom found that EE generated the most complaints for broadband as a proportion of its customer base for each quarter in the period Q1 2013 to Q1 2015.²³ The main parties said that they

²² The following section sets out the evidence for SFBB.

²³ Ofcom (June 2015), [Latest customer complaint numbers](#).

are not aware of any evidence that suggests that EE's quality of broadband service is stronger in Market A than elsewhere in the UK. [REDACTED]²⁴

34. We considered whether EE may be in a position to differentiate from its competitors through fixed-mobile bundles. Ofcom commissioned research in 2013 on mobile phone call quality and found that EE had a much higher rate of calls that were successfully connected in rural areas than its main competitors.²⁵ [REDACTED]
35. EE reported that its mobile offerings are of limited utility to customers located in Market A. [REDACTED] EE currently offers a higher mobile data allowance to mobile customers on their 4G pay monthly subscription who take fixed broadband with EE.²⁶
36. With regard to the importance of pricing and product differentiation in the choice of broadband provider, Figure 6 provides some evidence from a UK online panel that pricing was the most cited main reason for their choice of CP for individuals that recently made residential fixed broadband purchases [REDACTED].²⁷

Figure 6: Main reason for purchasing fixed broadband with chosen provider, UK

[REDACTED]

Source: [REDACTED]
[REDACTED]

Superfast broadband

37. Superfast broadband is not available in all Market A exchanges;²⁸ however, where it is available, EE offers fibre wherever BT has rolled out fibre, but Sky and TalkTalk only provide this in their on-net areas. In Market A1 (which is off-net for both Sky and TalkTalk), EE is therefore only one of a few competitors providing fibre services.

²⁴ For each of the 3-month periods to December 2012, December 2013 and December 2014, EE ranked lower than the CP leader (statistically significant difference). For these dates, the highest ranking of EE relative to competitor brands was 4th place. See EE Insight Monthly Reports for February 2013, February 2014 and February 2015.

²⁵ See Ofcom (August 2014), [Consumer experiences of phone calls](#) (94% of calls on the EE network were successfully connected, 87% on O2, 86% on Three and 80% on Vodafone during the second half of 2013).

²⁶ Data allowance increased by 10 GB (or 20 GB if the 4G subscription exceeds 46 pounds a month). [EE website: Broadband and Mobile Packages](#).

²⁷ 44% is the sum of responses for 'subscription cost', 'free broadband' and 'promotional offer'.

²⁸ We note that as of March 2015, the proportion of exchanges with fibre customers was [REDACTED]% for Market A2 and [REDACTED]% for Market A1. Not all fibre customers will receive superfast speeds but this gives an upper bound for superfibre provision. These figures are drawn from CMA analysis of BT data. This does not take account of Virgin Media, but this is not thought to significantly affect the results given the low network coverage of Virgin Media within Market A.

38. Regarding pricing, Plusnet applies a surcharge in Market A (for exchanges in Market A1), see Table 7. The other providers noted in Table 7 including EE do not charge a surcharge for Market A for fibre-based services provided to retail customers.
39. Table 8 provides a comparison of the largest CPs' lowest cost superfast broadband services for April 2014, March 2013 and March 2012 and show that EE's price, excluding line rental, is considerably higher than the other large CPs.
40. BT submitted that EE was not particularly price competitive in SFBB and, since April 2014, BT's competitors had offered increasingly aggressive SFBB offers. It noted that Sky currently offered SFBB for free for 12 months while TalkTalk's SFBB offers started at just £5 per month for six months and £10 thereafter. This compared with current entry level SFBB offers for BT of approximately £10 per month for 12 months, and for EE of £9.95 per month for 6 months then £19.95 per month on an 18 month contract.
41. [✂]
42. An internal review of the fibre market submitted by Sky dated 21 October 2014 compared fibre product pricing across the main CPs. This shows that – for entry level fibre products with 38 Mbit/s speed – EE's price including discounts is higher than Sky, TalkTalk, BT, Plusnet's. It is also higher than Virgin Media's 50 Mbit/s product.
43. Given these price differentials it appears likely that, EE is unlikely to exert a strong competitive constraint on BT in superfast broadband in Market A unless it offers significant promotions and factors around quality and other product differentiation features such as mobile bundles apply.

Table 7: Superfast broadband: additional costs for CP customers in Market A relative to other areas

CP	Customer type	Market A 'surcharge' (£/month)	Additional connection costs (£)	Other restrictions specific to Market A
BT	Domestic/business	0	0	Fibre is only available in areas where BT has rolled out fibre
Plusnet	Domestic	7.50 in Market A1*, otherwise 0	0	Fibre is only available in areas where BT has rolled out fibre
Plusnet	Business	6 (excluding VAT) in Market A1*, otherwise 0	0	Fibre is only available in areas where BT has rolled out fibre
EE	Domestic/business (small business and Corporate)	0	0	Fibre is only available in areas where BT has rolled out fibre
Sky	Domestic	0	0	Fibre is not offered to Sky off-net customers and is offered only where BT has rolled out fibre
TalkTalk	Domestic/business	0	0	Fibre is not offered to TalkTalk off-net customers and is offered only where BT has rolled out fibre
SSE	Domestic/business	0	0	Fibre is only available in areas where BT has rolled out fibre

Source: Parties and third parties.

Notes:

*[✂] Additionally, where Plusnet periodically runs 'free' offers (eg free broadband for 12 months), these offers commonly cover all market areas. Therefore there is no market price premium for the period of the offer

1. Generally fibre not available in market A and for EE customers, TV is only available to residential fibre customers. TV is not available to business customers in any area in the UK.

2. For Sky, the customer type was not specified in their response. We presume it covers domestic and business, this will be checked with the CP.

3. For BT, EE, Sky, SSE and the Post Office the surcharge describes the current position as at September 2015. For Plusnet, data is based on analysis for June 2014 to June 2015 for domestic and July 2014 to June 2015 for business.

4. The Post Office does not currently offer SFBB and so is not included in this table. [✂]

Table 8: A comparison of the largest CPs' lowest cost superfast broadband services, April 2014

	BT	Virgin Media	TalkTalk	Plusnet	Sky	EE
Headline download speed/technology	38 Mbit/s FTTC	50 Mbit/s cable	38 Mbit/s FTTC	38 Mbit/s FTTC	38 Mbit/s FTTC	38 Mbit/s FTTC
Monthly cost	£15 plus line rental	£15.50 plus line rental (or stand-alone at £25)	£13.50 plus line rental	£15.99 plus line rental	£20 plus line rental	£26 plus line rental

Source: Ofcom.

Note: Data from Figure 5.9 of the [2014 CMR](#); Figure 5.12 of the [2013 CMR](#); and Figure 5.5 of the [2012 CMR](#), all sourced from the Pure Pricing UK Broadband Pricing Briefing for April 2014, March 2013 and March 2012.

Switching

44. We looked at customer switching between CPs to see what further insights this provides over and above the recent market share statistics set out previously. We observe that in Market A, EE has a declining customer base in the recent period and the share of customers lost by EE to BT has increased over 2012 to 2015.

45. [✂]

46. EE provided estimates on the proportion of its customers lost to each of the main CPs in Market A using internal customer exit surveys over the period 2012 to 2015. We note that these exit surveys are voluntary and are likely to

be subject to non-response bias. If we take the view that non-response bias does not disproportionately affect any period or area more than another, our analysis of the survey results suggest the following points.

(a) [REDACTED]²⁹

(b) [REDACTED]³⁰

47. Other providers were not able to provide switching data for CP provenance and destination specifically for Market A. It is, however, useful to look at the switching rates for the UK as a whole and consider these alongside the evidence for the significant surcharge applied by EE in Market A for SBB as set out previously. This evidence suggests that in the recent period, BT loses a small proportion of customers to EE and EE loses a substantial number of customers to BT and Plusnet. Not all the results are disaggregated by SBB and SFBB; however, where results are disaggregated, we observe similar results. In addition, the share of customers lost to BT by EE could be similar to or higher than the proportion of customers lost by each of Sky and TalkTalk. This along with the significant surcharge that EE applies in Market A suggests that it is unlikely that EE imposes a significant competitive constraint on BT in Market A. The remainder of this section sets out this evidence in further detail.

48. Figure 7 shows evidence for the UK from an online panel for the new fixed broadband provider chosen by customers lost by each of the largest CPs for H2 2013 and H2 2014. Caution must be taken with the figures due to the low sample size for EE and because the survey results do not segment by product or broadband speed; however we find that the evidence tallies with other survey evidence for specific results where we have been able to conduct a comparison.³¹ The survey responses suggest that:

(a) [REDACTED]

(b) [REDACTED]³²

49. [REDACTED] BT loses a small proportion of customers to EE. The proportion switching from other CPs to EE was similarly small. Looking at the new fixed broadband provider chosen by respondent customers lost by BT, Figure 7 shows that [REDACTED]% of BT's customer losses were to EE in both H2 2013 and H2 2014. This does not provide a complete picture of losses by the BT Group to EE as this

²⁹ [REDACTED]
³⁰ [REDACTED]
³¹ [REDACTED]
³² [REDACTED]

does not take account of losses by Plusnet. We note that for H2 2013, the proportion of respondent customers lost by BT to EE was similar to that for TalkTalk ([REDACTED]), Sky ([REDACTED]) and Virgin Media ([REDACTED]). For H2 2014, the proportion of customers lost by BT to EE at [REDACTED] was lower than that for TalkTalk ([REDACTED]), Sky ([REDACTED]) but not Virgin Media ([REDACTED]). Relatively few of EE's customers were lost to Plusnet in either H2 2013 ([REDACTED]) and H2 2014 ([REDACTED]).

50. [REDACTED]

Figure 7: [REDACTED]

[REDACTED]

Source: [REDACTED]
[REDACTED]

Table 9: New retail fixed broadband provider chosen by customers lost by BT in Q4 2014

Provider	%	
	SBB	SFBB
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]
[REDACTED]	[REDACTED]	[REDACTED]
Total	100	100

[REDACTED]

BT's view of competitive constraints absent the merger

51. BT submitted that it does not consider EE to have a comparable value proposition, particularly relative to that of [REDACTED], and it says that this is reflected throughout BT's internal planning and market analysis materials. [REDACTED]
52. When asked about how it sets retail prices across different geographies, BT said that it prices its fixed voice, broadband and superfast broadband products on a national basis. [REDACTED]³³ It said that the relevant entry/expansion threat that BT faces comes from within Market B (which contains 89.8% of UK premises). BT does not consider possible Market A entry in setting its prices.
53. Plusnet differentiates broadband and superfast broadband product pricing geographically by 'low cost' ([REDACTED]) and 'other' (ie all remaining exchanges) geographies. BT said that Plusnet does not, however, consider EE to be a

³³ BT hearing summary.

meaningful constraint on the price, quality, or any other aspect of its provision of broadband services in either of these geographies.

54. The 'key competitors' mentioned in Plusnet's internal documents are [REDACTED]. [REDACTED]³⁴ are mentioned, but with no such emphasis. The pricing policy of Plusnet services seems to be guided by the aim of competing effectively with its key competitors and addressing the consumer demands of high data usage while maintaining an acceptable profit margin. [REDACTED]
55. There are no specific references to competition in high cost areas in Plusnet's internal documents. [REDACTED]
56. BT said that it does not differentiate between Markets A and B in its marketing strategies for BT or Plusnet fixed broadband products.

Entry/expansion in Market A

57. The likelihood of expansion in Market A appears to be low with regards to the current large CPs, particularly in Market A1. TalkTalk and Virgin Media have recently sold their off-net customer base.³⁵ [REDACTED]³⁶ This appears to indicate that large CPs have little appetite for providing broadband in off-net areas. However, if prices were to rise, there are no technical obstacles to entry: any CP would be able to buy a wholesale product from BT, and the broadband service would be the same as BT's in terms of speed and consistency of service.
58. Fleur Telecom is a recently established CP that is a retail broadband seller of BT's wholesale product to residential customers. In March 2015, it acquired all of TalkTalk's off-net customers ([REDACTED]) and its customers are predominantly rural and based in Market A. It is too early to note whether Fleur Telecom would be able to exert a significant competitive constraint post-merger. As set out previously in the 'Differentiation of broadband services in market A off-net areas' section, Fleur Telecom considers that it is unable to compete with BT/Plusnet on price for broadband as they sell below Fleur Telecom's costs. To be competitive, it offers a bundle that includes a highly discounted mobile package on a 30 day rolling contract with additional software, and it emphasises its UK call centre offering. Fleur Telecom said that while it is considering offering a simple TV service to its customers in the future it has no current plan anymore to include TV as part of its offering.³⁷

³⁴ [REDACTED].

³⁵ For Virgin Media, this applies to their residential customers only.

³⁶ [REDACTED]

³⁷ [REDACTED]

59. Vodafone said that [REDACTED].

Annex 1: Tables

This annex contains tables referred to in the main appendix.

Table 1: Ranking of CP Fixed broadband and line packages by average monthly price for offers promoted with entry-level speed (17 Mbit/s), February 2015

Rank	CP/ Brand	Package name	Inclusive phone calls	Speed	Download	Contract term	£		
							Headline monthly charge	Average monthly charge (Headline + line rental)	Average monthly charge including discount
1	Plusnet	Unlimited BB and calls	Fxd Weekends & On-net AT	17 Mbit/s	Unlimited	12	9.99	25.94	14.28
2	Sky	Sky BB Unlimited	Fxd Weekends	17 Mbit/s	Unlimited	12	7.50	23.90	16.40
3	TalkTalk	Simply Broadband	On-net AT	17 Mbit/s	Unlimited	18	3.50	20.20	17.87
4	EE	BB and Weekend Calls	Fxd Weekends	17 Mbit/s	Unlimited	12	9.95	25.70	18.25
5	BT	BB and weekend calls	Fxd Weekends	17 Mbit/s	10GB	12	4.75	21.74	21.74
6	BT	BB Extra and off-peak calls	Fxd Off-peak	17 Mbit/s	10GB	12	6.50	23.49	23.49
7	EE	BB and anytime Mobile Calls	Fxd AT (incl 30 intl dest), 1,000 mins Mob	17 Mbit/s	Unlimited	12	14.95	30.70	26.95
8	BT	Unlimited BB and weekend calls	Fxd Weekends	17 Mbit/s	Unlimited	12	13.00	29.99	29.99
9	BT	Unlimited BB Extra and weekend calls	Fxd Weekends	17 Mbit/s	Unlimited	18	21.00	37.99	34.32

Source: Pure Pricing UK Broadband Pricing Update, 11 February 2015.

Notes:

1. Listed offers are broadband and phone packages with 12-month and contract terms, and the offers are ranked according to the average monthly charge over the contract term. The average monthly charge shown in the last column takes account of monthly charges, promotional discounts, standard fixed line rental and other connection or activation fees. There were no connection fees applicable for any of the offers shown in this table.
2. The items indicated in the 'inclusive phone calls' column indicate calls included within the package. 'Fxd Weekends' refers to calls made to UK fixed lines at the weekend; 'On-net AT' refers to calls made to other users on the same fixed network (eg Plusnet to Plusnet) at any time during the week; 'Fxd Off-peak' refers to calls made to UK fixed lines during evenings and weekends; 'Fxd AT (incl 30 intl dest), 1,000 mins Mob' refers to calls made to UK fixed lines at any time during the week (including 30 international destinations) and 1,000 minutes to UK mobiles.
3. For Plusnet, the discount [X].
4. For BT, we understand that the discount applies to customers in both Market A and B.
5. For EE, we understand that the discount applies to customers in both Market A and B.
6. [X].

Table 2: Comparison across of main CPs of their lowest cost fixed broadband dual-play options – relative ranking from least expensive to most expensive

2014 (April)			2013 (March)			2012 (March)			2011 (June)		
Rank	CP	Price	Rank	CP	Price	Rank	CP	Price	Rank	CP	Price
1	TalkTalk	£19.45 (£14.00)	1	Plusnet	£19.98 (£16.48)	1	Plusnet	£19.48 (£15.98)	1	Plusnet	£18.48
2	Plusnet	£20.49	2	TalkTalk	£21.45 (£16.00)	2	AOL	£20.30	2	AOL	£19.09
3	Sky	£25.40	3	EE	£24.00	3	TalkTalk	£20.30 (£16.00)	3	O2	£21.00
4	BT	£25.99 (£21.75)	4	Sky	£24.50 (£19.95)	4	Sky	£22.25 (£19.95)	4	Sky (BSkyB)	£21.25
5	EE	£31.40 (£27.00)	5	O2	£26.50	5	Orange	£23.50	5	TalkTalk	£22.70
6	Virgin Media	£31.49 (£26.17)	6	BT	£28.45 (£23.75)	6	O2	£26.50	6	Orange	£24.00
			7	Virgin Media	£29.49 (£24.50)	7	Virgin Media	£28.40	7	Virgin Media	£26.49
						8	BT	£28.60 (£24.75)	8	BT	£26.90

Source: [Ofcom CMR 2014](#), p356. [Ofcom CMR 2013](#), p366. [Ofcom CMR 2012](#), p341. [Ofcom CMR 2011](#), p312.

Notes:

1. Lowest-cost fixed broadband dual-play option for each CP shown.
2. All tariffs exclude activation charges and promotional discounts and include VAT; all tariffs are the lowest price available; contract lengths vary; allowances for fixed-line included within packages may differ by operator and option; figures in brackets require prepayment of 12 months' line rental.
3. Sky bought O2 customers on 1 May 2013; Orange brand currently incorporated within CP EE (currently no new customers accepted under the Orange brand); AOL broadband was provided by TalkTalk Group under the AOL Broadband brand. Since April 2014, AOL broadband no longer available to new customers).

Retail fixed broadband: superfast broadband

1. This appendix provides supplementary information to support the analysis discussed in Chapter 21.

Coverage of SFBB

2. Increasing numbers of people live in areas where SFBB services are available. Currently 83% of UK premises are in SFBB-enabled areas¹ and availability is expected to increase to 90% of UK premises by 2016 and 95% by 2017.²
3. Currently, the majority of UK connections are SBB. However, take up of SFBB is increasing and by the end of 2014 over 30% of retail broadband connections had a headline (advertised) speed of 30 Mbit/s or higher.³ Out of the 23.7 million residential and SME fixed broadband lines in the UK, around 3.6 million are fibre-based lines and 4.5 million are cable lines.⁴
4. The increasing popularity of devices and services requiring internet access as well as the multiplication of the number of gadgets used in a typical home (Smart TV, on-demand TV and video services, tablets and games consoles) is leading to a rapid growth in bandwidth consumption. As such, almost eight in ten households (78%) now have a fixed broadband connection, and take-up of SFBB has increased significantly from 0.2% in 2009 to almost one in three today. Alongside this, speeds have increased significantly at an average rate of 36% per year, from 3.6 Mbit/s in November 2008 to 22.8 Mbit/s in November 2014.⁵
5. The availability of fixed broadband, and the limits on large download allowances for mobile data as well as download speeds, mean that mobile

¹ Ofcom (August 2015), [Communications Market Report](#), p1.

² BDUK is a governmental body charged with providing SFBB to premises that cannot be covered commercially, so that 90% of all premises can achieve superfast speeds by the end of 2016 (phase 1), and 95% by the end of 2017 (phase 2). BT is installing the SFBB network in phase 1 (it was awarded all phase 1 contracts). See [Analysys Mason \(February 2015\), Report on UK Telecom market](#), p12.

³ Ofcom (August 2015), [Communications Market Report](#).

⁴ Figures for end 2014. Ofcom (6 August 2015), [The Communications Market Report](#), pp287 & 288.

⁵ Ofcom (August 2015), [Communications Market Report](#), p1. Note that these are average speeds for the UK and will vary by area.

broadband is not likely to be seen as a viable substitute for fixed for the majority of users at the current time.⁶

Supplementary evidence on constraint of SBB on SFBB

6. Regarding price differentials between SBB and SFBB, subsequent to its 2014 Market Review, Ofcom continued to note from April 2014 pricing data that although the price of both SBB and SFBB has changed since early 2013, the difference between them remains at £5 to £10 a month.⁷
7. We note evidence regarding customer preference for different types of broadband speeds. In the August 2015 hearing with the CMA, Ofcom cited research it had conducted on residential broadband customers and the speed they experience. It submitted that that there is an increasingly compelling argument that speeds of 10Mbit/s are needed to achieve an effective quality of service, especially where there is simultaneous use of the connection by different services or users within the home.⁸ BT submitted that average ADSL speeds reported by Ofcom in the 2014 WBA Market Review are capable of accommodating all (including streaming high definition video) but the most data intensive applications.
8. We note that the majority of consumers either do not know their speed or perceive it to be below 23Mbit/s (Ofcom defines SFBB to be actual speeds of 30Mbit/s or more). Research by Kantar provided to the CMA by EE indicates that [redacted] consumers do not know their speed and [redacted] consumers perceived their speed to be 23 Mbit/s or less. Just under [redacted] consumers perceived their speed to exceed 24 Mbit/s. See Figure 1.

Figure 1: Customer perceptions of their of fixed broadband speed for UK and by brand over 6-month period to 31 December 2014

[redacted]

Source: [redacted]

Notes: [redacted]

9. [redacted]
10. An internal EE document dated Q4 2013 notes that SFBB pricing is becoming increasingly competitive and CPs are pushing aggressive price promotions to encourage SFBB uptake.

⁶ [Analysys Mason \(February 2015\), Report on UK Telecom market](#), p9. [Ofcom \(2014\) Wholesale Broadband Access review](#) notes that fixed broadband continues to slowly replace mobile broadband and be taken up in previously unconnected homes, but not at rates previously seen.

⁷ Ofcom (2014), [Communications Market Review 2014](#), p311.

⁸ Ofcom (2015), [Citizens and communications services](#).

11. An internal BT document from April 2014 states that [REDACTED]. This was one of the main messages BT employed in marketing its SFBB 'Infinity' product: 'BT Infinity customers are so impressed, 90% never want to go back to standard broadband'. The document also notes that [REDACTED].
12. We note that the Parties and third parties expect SFBB take-up to increase, and there is still a sizeable pool of SBB customers who have not converted to SFBB.⁹
13. We note that the aforementioned evidence suggests that if CPs are seeking to increase SFBB take-up from among the existing pool of SBB customers, then the price of SFBB is likely to continue to be constrained by that of SBB in order to attract consumers to switch.

Share of supply data

14. Table 1 shows the retail market shares for SBB and SFBB. In SFBB, EE is one of a few competitors to BT, but does not have large market share (up to 2% in Q1 2015). The largest competitors to BT are Virgin Media, Sky and TalkTalk that together have around 61% share.

Table 1: Retail market shares for fixed broadband, UK, Q1 2015

	<i>All</i>		<i>SBB only</i>		<i>SFBB only</i>	
	<i>Number</i>	<i>Share (%)</i>	<i>Number</i>	<i>Share (%)</i>	<i>Number</i>	<i>Share (%)</i>
BT	7,713	32	4,703	30	3,010	36
Virgin Media	4,564	19	493	3	4,071	49
Sky	5,528	23	5,028	32	500	6
TalkTalk	4,283	18	3,804	24	479	6
Other	1,916	8	1,712	11	204	2
<i>Of which EE</i>	884	4	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
Total	24,003	100	15,739	100	8,264	100

Source: Enders Analysis except for figures for EE for SBB only and SFBB only which are sourced directly from EE response to information request.

Notes:

1. Covers residential and business customers.
2. 'Number' represents the number of lines in thousands.
3. Figures for EE for SBB only and SFBB only are for May 2015.

15. Figure 2 shows the retail shares of supply for the top five largest CPs with headline speeds of 30 Mbit/s or more.¹⁰ The two main providers are BT and Virgin Media, which respectively had a share of [REDACTED] in Q4 2014. Other providers have rapidly increased their share from a negligible amount in Q3 2012 to [REDACTED]% by Q4 2014, with Sky and TalkTalk contributing most to this increase. Sky increased its share from [REDACTED]% in Q3 2012 to [REDACTED]% in Q4 2014.

⁹ Less than one in three retail broadband connections had headline speeds of 30Mbps or more by the end of 2014.

¹⁰ Note that not all these connections will actually achieve the headline speed of 30Mbps. The figure therefore gives an indication of the likely market shares for SFBB rather than the actual market shares.

TalkTalk offered broadband at these speeds from Q2 2013 and had a share of [redacted]% by Q4 2014. EE also started offering broadband at these speeds from Q2 2013 and had increased its share to [redacted]% by Q4 2014.

Figure 2: Top five CPs' retail share of supply for broadband services with headline speeds of 30Mbit/s and above

[redacted]

Source: [redacted]

Notes: [redacted]

16. While we do not have data on market shares outside Virgin Media's network areas, given the UK trend, it is likely that Sky and TalkTalk are also increasing their market share in these areas. [redacted]

(a) [redacted]

(b) [redacted]

(i) [redacted]

(ii) [redacted]

Table 2: Share of supply of fibre customers using BT network (ie excluding Virgin Media), UK

	2012		2013				2014				2015		
	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	%
BT Consumer	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Plusnet	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total BT	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Sky	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
TalkTalk	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
EE	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Other	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]
Total subscribers (thousands)	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]	[redacted]

Source: [redacted]

Notes:

1. Excludes Virgin Media.

2. Includes Northern Ireland.

3. TTG's (and other CPs') volumes will include any fibre customers they provide on a wholesale basis to other CPs.

17. Looking towards potential future trends, according to data on projected shares of supply received by Ofcom, [redacted].¹¹

Figure 3: Forecasts for top five CPs' share of SFBB connections (top five CP forecasts)

[redacted]

Source: [redacted]

Notes: [redacted]

¹¹ Separate forecast figures for SFBB were not provided.

Supplementary information on network expansion

18. Virgin Media is expanding its cable network to reach an additional 4 million premises which by 2020 is estimated to increase its coverage from 44% to 57% of UK premises.¹²
19. Sky, TalkTalk and the wholesale operator CityFibre entered into a joint venture agreement to provide FTTP in York to reach around 20,000 premises with the first customers expected to be connected in autumn 2015.¹³ TalkTalk previously announced an ambition to reach 10 million households with FTTP within a five- to ten-year period if York trials are successful.¹⁴

Supplementary information on acquisitions

20. In terms of SFBB acquisitions, while EE share is likely to be higher than its share of the overall SFBB customer base, its share is still small (currently less than 4%).
21. Table 3 shows the retail market share for SFBB acquisitions. For BT, the share of SFBB additions in the year ending Q1 2015 was 42%, slightly higher than its estimated share across the whole SFBB customer base (36%). While separate figures for EE were not available, it is likely that EE's share of SFBB acquisitions (less than 4%) is slightly higher than its market share across the whole SFBB customer base (up to 2%).¹⁵ For TalkTalk and Sky, their share of SFBB acquisitions (13% for TalkTalk and 12% for Sky) is around twice as high as their share of the whole SFBB customer base (6% for TalkTalk and 6% for Sky).¹⁶
22. EE reported that since it launched fibre at the end of 2012, it has managed to grow its subscriber share from around [X]% in [X] to around [X]% in [X]. This represents a net increase of around [X] customers over two years. It noted that in comparison, in Q1 of 2015 alone Virgin has gained 148,000 and TalkTalk has gained 83,000 SFBB customers.¹⁷

¹² [Enders Analysis UK broadband, telephony and pay TV trends Q4 2014](#).

¹³ TalkTalk press release, 'TalkTalk unveils York ultrafast broadband packages and prices'; CityFibre initial submission; Enders Analysis UK broadband, telephony and pay TV trends Q4 2014; ISPReview news, 'Sky, TalkTalk and CityFibre to Expand 1Gbps FTTP Broadband Rollout in York'.

¹⁴ CityFibre initial submission; Enders Analysis UK broadband, telephony and pay TV trends Q4 2014.

¹⁵ See notes to Table 3.

¹⁶ Shares for Q1 2015, all figures from [Enders Analysis \(2015\), UK fixed line market Q1 2015 report](#).

¹⁷ [BT/EE response to issues statement](#), paragraph 20.2cii.

Table 3: SFBB customer acquisitions, UK

	<i>Thousands</i>		
	<i>Year to Q1 2013</i>	<i>Year to Q1 2014</i>	<i>Year to Q1 2015</i>
BT	722	869	905
Virgin Media	1,670	898	659
TalkTalk	65	134	272
Sky	64	179	257
Others (including EE)	22	84	82
Total	2,543	2,164	2,175
	%		
BT	28.4	40.1	41.6
Virgin Media	65.7	41.5	30.3
TalkTalk	2.6	6.2	12.5
Sky	2.5	8.3	11.8
Others (including EE)	0.9	3.9	3.8
Total	100	100	100

Source: [Enders Analysis \(2015\), UK fixed line market Q1 2015 report](#).

Note: Separate figures for EE were not available in the report; [X].

Supplementary information on SFBB acquisition routes

23. In this section we review the extent to which SFBB customers are acquired through upgrade rather than through competition in the market. This will help us to assess the extent to which third parties may be able to exert sufficient competitive constraint on the merged entity post-merger and the degree to which EE currently poses a competitive constraint on BT pre-merger.
24. We observe that there is variation across competitors in the extent to which SFBB customers are acquired through upgrade rather than competition in the market. For [X] and [X], currently most SFBB acquisitions are from competitors, whereas around two years ago most SFBB acquisitions were from existing SBB customers upgrading to SFBB. For [X] and [X], the source of most SFBB acquisitions continues to be existing customers upgrading from its SBB service and/or from other services ([X] or [X]). In this section we analyse this evidence further.
25. [X]¹⁸
26. For EE, the proportion of its fibre customer additions that were customers upgrading from SBB has [X].

¹⁸ This is similar to survey evidence collated by [Ofcom in its 2013 Communications Market Report](#), which found that 62% of BT fibre customers had been BT customers (for ADSL cable or mobile broadband) before upgrading to their superfast service. We do not place reliance of the figures for TalkTalk and Sky because of the low sample size and inconsistency with other data received from suppliers. See [Populus research in: Ofcom \(August 2013\), Ofcom Communications Market Report 2013](#), p327. The Populus research was conducted online among a sample of 1,215 superfast users in March 2013, and all respondents were UK adults aged 18+. The number of respondents was 1,012; BT Infinity: 244; Virgin Media: 595; Sky: 61; TalkTalk: 76. The question posed was: which internet service provider did your household use before you subscribed to your (current) service?

27. EE also acquires a significant number of SFBB customers from its mobile customer base. At the time of purchase, [redacted] of new fibre customers were subscribers to EE's mobile phone service and [redacted]% of new fibre customers were new to EE (see Table 4). The CMA notes that [redacted]. This large customer base has contributed to growing EE's small share of SFBB however we note that EE's net additions for SFBB have nevertheless been lower than those of BT, Virgin Media, TalkTalk and Sky in the year to Q1 2015,¹⁹ and relatively few of EE's mobile customers are also fixed customers of EE.²⁰
28. [redacted]²¹ [redacted] EE informed the CMA that the vast majority of its marketing is targeted at its existing customers rather than generic newspaper or TV advertising.²²
29. For Sky [redacted] see Table 6. Sky's pay TV service is the biggest in the UK, with [redacted] subscribers as of Q3 2014. Since launching fixed broadband and voice services in 2006, Sky has been successful at upgrading its pay TV base such that customers take the products from Sky (phone, broadband and TV), and had [redacted] users by Q3 2014.²³
30. TalkTalk said that [redacted]. It said that now around 41% of BT's broadband customers are on SFBB so there is a larger pool of existing fibre customers for it to acquire.

Figure 4: BT SFBB additions by source (internal upgrades/new acquisitions), UK

[redacted]

Source: [redacted]
 Note: [redacted]

¹⁹ CMA analysis of Enders Analysis data. See Table 3 for SFBB customer acquisitions data.

²⁰ [redacted]

²¹ See Table 5.

²² [EE hearing summary](#).

²³ [Analysys Mason \(February 2015\), Report on UK Telecom market](#), p7.

Table 4: EE SFBB additions by source (internal upgrades / new acquisitions), UK

	2013	2014	2015
Upgrades from EE SBB to EE SFBB	[REDACTED]	[REDACTED]	[REDACTED]
Upgrades from other EE products*	[REDACTED]	[REDACTED]	[REDACTED]
New to EE†	[REDACTED]	[REDACTED]	[REDACTED]
Total	[REDACTED]	[REDACTED]	[REDACTED]
			[REDACTED]
Upgrades from EE SBB to EE SFBB	[REDACTED]	[REDACTED]	[REDACTED]
Upgrades from other EE products‡	[REDACTED]	[REDACTED]	[REDACTED]
New to EE§	[REDACTED]	[REDACTED]	[REDACTED]
Total	100	100	100

Source: [REDACTED]

*[REDACTED]

†[REDACTED]

‡[REDACTED]

§[REDACTED]

Note: [REDACTED]

Table 5: Sky SFBB additions by source (internal upgrades / new acquisitions), UK

	%			
	2012	2013	2014	2015*
Upgrades from Sky SBB to Sky SFBB†	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
Upgrades from other Sky products‡	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
New to Sky§	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
Total	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]

Source: [REDACTED]

Notes: [REDACTED]

*[REDACTED]

†[REDACTED]

‡[REDACTED]

§[REDACTED]

Supplementary information on pricing

31. Table 6 provides a comparison of the largest CPs' lowest cost SFBB services for April 2014, March 2013 and March 2012. It shows that the headline monthly cost of EE's lowest cost SFBB package were considerably higher than the other large CPs.²⁴
32. The main parties submitted that EE is not especially price competitive on SFBB.
 - (a) EE's standard 38MB fibre monthly rental price for an 18 month contract is £19.95. TalkTalk's and Vodafone's newly launched services are both priced at £15, and BT charges £14.99 through its Plusnet brand and £12.50 for a 12 month contract on BT-branded products. Virgin Media charges £17.50 for a similar product over the same period.

²⁴ Even taking account of line rental, the overall cost of EE is higher – there is little dispersion in line rental prices across the main CPs over 2012 to 2014, see [Ofcom \(2015\), Communications Market Report](#), Figure 4.22 Residential line rental prices: 2006–2014.

(b) While EE has an introductory half price offer for the first six months at £9.99 per month, Sky has a capped SFBB offer of free SFBB for 12 months followed by £10 per month. Sky's fully uncapped SFBB product is available for £10 per month. TalkTalk offers its service at £10 per month for the first 12 months, Vodafone at £7.50 per month for 12 months for existing Vodafone customers, Virgin for £5 per month for the first 12 months, and BT for free for the first six months through its Plusnet brand.²⁵

33. EE internal reviews of the fibre market dated August 2014, November 2014 and March 2015 that compare competitor fibre pricing in the previous month show that EE's price was higher than that for BT, Plusnet, Virgin Media, Sky and TalkTalk for both entry level fibre products (38 Mbit/s) and those with higher speeds (76 Mbit/s).
34. An internal review of the fibre market submitted by Sky dated 21 October 2014 compares fibre product pricing across the main CPs. This shows that for entry level fibre products with 38 Mbit/s speed, EE's price including discounts is higher than Sky, TalkTalk, BT, Plusnet and also higher than Virgin Media's 50 Mbit/s product.
35. Given these price differentials, it appears that EE is unlikely to exert a strong competitive constraint on BT in SFBB unless it offers significant promotions and factors around quality and other product differentiation features such as mobile bundles apply. This is discussed further in the following section.

Table 6: A comparison of the largest CPs' lowest cost SFBB services, 2012-14

	<i>BT</i>	<i>Virgin Media</i>	<i>TalkTalk</i>	<i>Plusnet</i>	<i>Sky</i>	<i>EE</i>
Headline download speed/technology	38Mbit/s FTTC	50Mbit/s cable	38Mbit/s FTTC	38Mbit/s FTTC	38Mbit/s FTTC	38Mbit/s FTTC
Monthly cost	£15 plus line rental	£15.50 plus line rental (or stand-alone at £25)	£13.50 plus line rental	£15.99 plus line rental	£20 plus line rental	£26 plus line rental

Source: Ofcom.

Note: Data from Figure 5.9 of the [2014 CMR](#), Figure 5.12 of the [2013 CMR](#), and Figure 5.5 of the [2012 CMR](#), all sourced from the Pure Pricing UK Broadband Pricing Briefing for April 2014, March 2013 and March 2012.

Supplementary information on non-price factors affecting the degree of competitive constraint that EE poses

36. With regard to the quality of service, while we do not have results for SFBB alone we note that Ofcom found that EE generated the most complaints for

²⁵ [BT/EE response to issues statement](#), paragraph 20.16.

broadband as a proportion of its customer base for each quarter in the period Q1 2013 to Q1 2015.²⁶ [REDACTED]²⁷

37. We considered whether EE may be in a position to differentiate from its competitors through fixed-mobile bundles. [REDACTED].²⁸ EE currently offers a higher mobile data allowance to mobile customers on their 4G pay monthly subscription who take fixed broadband with EE.²⁹
38. Ofcom commissioned research in 2013 on mobile phone call quality and found that EE had a slightly higher rate of calls that were successfully connected across the UK.³⁰ [REDACTED]
39. We note that several other providers offer, or plan to offer, mobile services that are available only to, or with a discount for, their broadband customers.³¹
40. With regard to the importance of product differentiation in the choice of broadband provider, while we do not have figures for SFBB alone we note that pricing appears to be an important driver for fixed broadband purchases. [REDACTED].³² [REDACTED]

Figure 5: [REDACTED]

[REDACTED]

Source: [REDACTED]

Notes: [REDACTED]

41. [REDACTED]

42. [REDACTED]

BT's view of competitive constraints absent the merger – internal documents

43. Our review of BT Consumer's internal strategy documents on broadband found that [REDACTED]. EE is not seen as a major competitor. We note the following points:

²⁶ Ofcom (June 2015), [Latest customer complaint numbers](#).

²⁷ [REDACTED]

²⁸ BT, TalkTalk, Sky, Virgin Media. Fixed/mobile bundles are currently offered by Virgin Media, TalkTalk and EE. BT has launched a SIM-only mobile package and Sky is set to launch its own fixed/mobile bundles in 2016. Vodafone recently launched its fixed/mobile service, and has announced its intention to add TV services.

²⁹ Data allowance increased by 10 GB (or 20 GB if the 4G subscription exceeds £46 a month). [REDACTED]

³⁰ See Ofcom (2014), [Consumer experiences of mobile phone calls](#). 97% of calls on the EE network were successfully connected, 95% on O2, 94% on Three and 93% on Vodafone during the second half of 2013.

³¹ BT, TalkTalk, Sky, Virgin Media. Fixed/mobile bundles are currently offered by Virgin Media, TalkTalk and EE. BT has launched a SIM-only mobile package and Sky is set to launch its own fixed/mobile bundles in 2016. Vodafone recently launched its fixed/mobile service, and has announced its intention to add TV services.

³² [REDACTED]

(a) A common theme across all documents reviewed is that [redacted] is seen as a particularly strong competitor. BT's assessment of the degree of competitive threat posed by [redacted] varies. [redacted]

(b) [redacted]. We observe that there is either cursory or no mention of EE in more recent reviews. [redacted]

44. In the remainder of this section we set out this evidence in further detail.

45. We observe from BT's internal assessment of the broadband market in the quarter to end March 2015 (Q3 of BT's financial year) that EE's broadband proposition is not mentioned at all in the review apart from a brief appearance in a table of market shares of broadband acquisitions. BT's assessment otherwise only addresses the competitive threat of [redacted] in relation to the whole broadband market (not specifically fibre). [redacted] in particular is noted to have the highest customer consideration for broadband in the market. BT notes that it acquired around a third of [redacted] broadband churners, as customers start to come out of their contract with [redacted]. They are attracted by the 'promise of free stuff and better customer service'.

46. BT's internal review of the market and competitor context in December 2014 contains the following remarks:

(a) [redacted]

(b) [redacted]³³

(c) [redacted]³⁴

(i) [redacted]

(ii) [redacted]

(iii) [redacted]

(d) [redacted]

(e) [redacted]³⁵

(f) [redacted]

33 [redacted]

34 [redacted]

35 [redacted]

Figure 6: [X]

[X]

Source: [X]
Note: [X]

Figure 7: [X]

[X]

Source: [X]
Note: [X]

47. [X]³⁶ [X]

(a) [X]³⁷

(b) [X]

(c) [X]

(d) [X]

(e) [X]

(f) [X]

(g) [X]

(h) [X]

(i) [X]³⁸

³⁶ [X]
³⁷ [X]
³⁸ [X]

Glossary

2G	Second generation of mobile telephony systems. Uses digital transmission to support voice, low-speed data communications, and short messaging services.
3G	Third generation of mobile systems. Provides high-speed data transmission and supports multi-media applications such as video, audio and internet access, alongside conventional voice services.
4G	Fourth generation of mobile systems. Designed to provide faster data download and upload speeds on mobile networks.
Access network	The part of a telecommunications network that connects an end user with the local telephone exchange from which point lines are connected to the core telecommunications network.
ADSL	Asymmetric Digital Subscriber Line. Broadband technology that makes use of copper lines in the local access network.
AISBO	Alternative interface symmetric broadband origination. A form of symmetric broadband origination service providing symmetric capacity between two sites, generally using an Ethernet IEEE 802.3 interface.
Backhaul	Backhaul is the carriage of traffic from an exchange to a central point: transmission links used to connect local exchanges to each other and/or the core network. In the context of mobile networks, we use the term backhaul to denote the network connectivity between an MNO's radio base stations (which make up the RAN) and its core network. Mobile backhaul usually includes a connection from the base station site to a local exchange and additional connectivity from a local exchange to a POC or POP with the MNO's core network.
Bandwidth	In digital telecommunications systems, the rate measured in bits per second (bit/s), at which information can be transferred.
Basket	Ofcom grouping of BT services for the purpose of determining a charge control.

BCMR	Business Connectivity Market Review. Review of retail leased lines , wholesale symmetric broadband origination and wholesale trunk segments.
BT	BT Group plc (which includes British Telecommunications plc).
BT Wholesale	Operating division of BT. BT Wholesale provides wholesale telecommunications services to businesses and other CPs .
CAGR	Compound annual growth rate. The average year-on-year rate of change during a period.
CityFibre	CityFibre Infrastructure Holdings plc.
CMA	Competition and Markets Authority.
CP	Communications provider. An organisation that provides electronic communications services.
CTIL	Cornerstone Telecommunications Infrastructure Limited. A joint venture between Vodafone and O2 .
Dark fibre	Unconfigured optical fibre laid ready for users to install their own transmission equipment. Because no light source has been applied, it is 'dark'.
DSL	Digital Subscriber Line. A family of technologies generically referred to as DSL or xDSL that enable ordinary copper telephone lines to transmit broadband signals.
DSLAM	Digital Subscriber Line Access Multiplexer. Apparatus used to combine many local loops into one data path.
DT	Deutsche Telekom AG.
EAC	Ethernet Access Connect. A BT Wholesale Ethernet product that offers similar functionalities to EAD .
EAD	Ethernet Access Direct. An Openreach wholesale Ethernet product which that offers permanently connected, point-to-point high-speed data circuits that provide a secure and uncontended access service for CPs .
EBIT	Earnings before interest and tax (also referred to as operating profit).

EBITDA	Earnings before interest, tax, depreciation and amortisation.
EE	EE Limited.
EOI	Equivalence of Inputs. A remedy designed to prevent a vertically-integrated company from discriminating between its competitors and its own business in providing upstream inputs. Where applied, this requires BT to provide the same wholesale products to all CPs including BT's own downstream division on the same timescales, terms and conditions (including price and service levels) by means of the same systems and processes, and includes the provision to all CPs (including BT) of the same commercial information about such products, services, systems and processes.
Ethernet	A packet-based technology originally developed for and still widely used in local area networks. Ethernet networking protocols are defined in IEEE 802.3 and published by the Institute of Electrical and Electronics Engineers. Developments of this technology known as Metro Ethernet or Carrier Ethernet are now being used in CPs' networks to provide leased line and backhaul services.
Exchange	The building and equipment located within the exchange area and to which all customers are connected via the access network .
FDD	Frequency division duplexing. The means by which signals moving between two elements in opposite directions are separated.
FMC	Fixed mobile convergence. Capabilities that provide seamless connectivity between fixed and mobile networks by supporting services and applications to the end user irrespective of the underlying access technology.
FTTC	Fibre to the Cabinet. Access network consisting of optical fibre extending from the access node to the street cabinet. The street cabinet is usually located only a few hundred metres from the subscribers' premises. The remaining segment of the access network from the cabinet to the customer is usually a copper pair.

FTTH	Fibre to the Home. A form of fibre optic communication delivery in which the optical signal reaches the end user's home.
FTTP	Fibre to the Premises.
Gbit/s	Gigabits per second (1 Gigabit = 1,000,000,000 bits) A measure of bandwidth in a digital system.
GEA	Generic Ethernet Access.
GHz	Gigahertz. A unit of frequency.
H3G	Hutchison 3G UK Ltd.
IEEE	Institute of Electrical and Electronics Engineers.
Infrastructure	General term used to refer to all the equipment and plant used to provide connectivity and services to customers.
IP	Internet Protocol. The packet data protocol used for routing and carriage of messages across the internet and similar networks.
ISDN	Integrated Services Digital Network.
ITC	Invitation to comment.
Leased line	A permanently connected communications link between two premises dedicated to the customer's exclusive use, providing dedicated transmission capacity between customer sites, which can be used to carry voice, data and video traffic.
LLCC	Leased Lines Charge Control.
LLU	Local loop unbundling. The process by which providers take control (in whole or part) of the copper loop connecting a customer's premises to the local telephone exchange . The provider is given access to the exchange to install its own equipment to connect the customer to the provider's own network.
Local loop	In fixed networks a local loop is the access network connection between the customer's premises and the local

serving **exchange**, usually two copper wires twisted together.

LTE	Long Term Evolution, also known as 4G .
MB	Megabyte.
Mbit/s	Megabits per second.
MBNL	Mobile Broadband Network Limited. Joint venture company owned by H3G and EE.
MCT	Mobile call termination. The service provided by an MCP to allow an originating CP to connect a caller with the intended mobile call recipient on that MCP's network.
MEAS	Managed Ethernet access service.
MHz	Megahertz. A unit of frequency.
Migration	Movement of customers from one type of service to another.
MISBO	Multiple Interface Symmetric Broadband Origination. A form of symmetric broadband origination service providing symmetric capacity from a customer's premises to an appropriate point of aggregation in the network hierarchy for services with bandwidths greater than 1 Gbit/s or services of any bandwidth delivered using WDM equipment at the customer's premises.
MNO	Mobile network operator, a provider that owns a cellular mobile network.
MPF	Metallic Path Facility. Allows a CP to provide both SBB and fixed voice services to a customer.
MTR	Mobile termination rate. The wholesale charge levied by MCPs for MCT .
MVNA	Mobile virtual network aggregator, resells its own MVNO agreement.
MVNE	Mobile virtual network enabler. Provides network infrastructure and related services that enable MVNOs to offer services to their customers.
MVNO	Mobile virtual network operator.

NGA	Next Generation Access. A new or upgraded access network capable of supporting much higher capacity broadband services than traditional copper access networks. Generally an access network that employs optical fibre connections in whole or in part.
O2	The UK commercial brand under that Telefónica primarily operates.
Ofcom	Office of Communications, the communications sector regulator.
Openreach	An operating division of British Telecommunications plc, Openreach provides wholesale telecommunications services to CPs .
Orange	Orange S.A.
OTT	‘Over-the-top’ services, such as Skype or WhatsApp, which provide voice and text services over customers’ data connections.
Parallel transaction	Where the CMA may be required to consider a merger at a time when there is the prospect of another merger in the same market.
PO	Principal Operator. Term used by Ofcom for relatively large CPs with a substantial presence across the UK as a whole, on the basis of network coverage.
POC	Point of Connection. A point where one CP interconnects with another CP for the purposes of connecting their networks to third party customers in order to provide services to those end customers
POP	Point of Presence. A node in a CP ’s network (such as an exchange or other operational building), generally one used to serve customers in a particular locality.
PSTN	Public Switched Telephone Network. The worldwide collection of public telephone networks designed primarily for voice traffic.
RAN	Radio Access Network.

RBS backhaul	Radio Base Station backhaul. A circuit provided by BT that connects a mobile MCP 's base station to the MCP's mobile switching centre.
RPI	Retail Prices Index. A measure of inflation published monthly by the Office for National Statistics. It measures the change in the cost of a basket of retail goods and services.
RPI-X	A general term referring to a common method of regulating prices where prices are regulated to move by the Retail Price Index minus a percentage defined by X.
SBB	Standard broadband.
SDH	Synchronous Digital Hierarchy. A digital transmission standard that is widely used in communications networks and for leased lines .
SDL	Supplemental downlink spectrum which can only be used when paired with FDD uplink capacity.
SFBB	Superfast broadband.
Sky	Sky plc, a home entertainment and communications provider.
SLC	Substantial lessening of competition.
SMP	Significant Market Power.
SMPF	Shared Metallic Path Facility. Allows a CP to offer SBB only, and it (or another CP) can offer voice services to the same customer using Openreach 's WLR product.
SPA	Sale and Purchase Agreement.
Spectrum	The frequency range of the electromagnetic spectrum that can be used for wireless communication, including by mobile.
Symmetric transmission capacity	A service that allows signals to be transmitted and received at the same bandwidth .
TalkTalk	TalkTalk Telecom Group, a UK-based broadband and voice provider.

TB	Terabyte (1 Terabyte = 1,000 Gigabytes).
TDD	Time division multiplexing. A method of combining multiple data streams for transmission over a shared channel by means of time-sharing. The multiplexer shares the channel by repeatedly allowing each data stream in turn to transmit data for a short period.
Telefónica	Telefónica UK Limited.
TI	Traditional interface. Makes use of time division multiplexing or analogue. Most common bandwidth is 2 Mbit/s – ranges from 64 kbit/s to 155 Mbit/s.
TISBO	Traditional interface symmetric broadband origination. A form of symmetric broadband origination service providing symmetric capacity from a customer's premises to an appropriate point of aggregation in the network hierarchy.
UIL	Undertakings in lieu.
Virgin Media	Virgin Media Limited, a subsidiary of Liberty Global plc.
Vodafone	Vodafone Limited, a UK subsidiary of the Vodafone Group.
VoIP	Voice over IP. A generic term used to describe telephony services provided over IP networks.
VoWiFi	VoWiFi is a Wi-Fi based VoIP service.
VULA	Virtual unbundled local access.
WBA	Wholesale broadband access.
WDM	Wavelength-division multiplex. An optical frequency division multiplexing transmission technology that enables multiple high-capacity circuits, to share an optical fibre pair by modulating each on a different optical wavelength.
WECLA	Western, Eastern, Central and East London Area. A geographic market defined by Ofcom .
WES	Wholesale Extension Service. A BT Wholesale Ethernet product that can be used to link a customer premise to a node in a communications network.

WFAEL	Wholesale fixed analogue exchange lines.
Wi-Fi	A local area network that uses high frequency radio signals to transmit and receive data over distances of a few hundred feet, using Ethernet protocol.
WLA	Wholesale local access.
WLR	Wholesale Line Rental. An Openreach product whereby the CP rents a line from Openreach and resells the line to the end-customer. WLR provides a voice-only service.
xDSL	See DSL .
Zayo	Zayo Group UK Limited.