Wholesale Broadband Access Market Review 2018

Final Statement Annexes 2-8

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Contents

Annex

A2. Glossary

4G: Fourth generation of mobile telephony systems, including the LTE technology standard.

Access Network: The part of the network that connects directly to customers from the local exchange.

Asymmetric Digital Subscriber Line (ADSL): A type of digital subscriber line technology, a data communications technology that enables faster data transmission over copper telephone lines rather than a conventional voiceband modem can provide.

Bandwidth: The rate at which data can be transmitted, and usually expressed in bits per second (bit/s). Sometimes known as throughput.

BDUK: Broadband Delivery UK.

BEREC: Body of European Regulators for Electronic Communications.

BT: British Telecommunications plc.

BT Consumer: A division of BT concerned with the consumer retail market.

BT Wholesale & Ventures: The division of BT which provides wholesale services to communications providers.

Charge Control: A control which sets the maximum price that a telecoms provider can charge for a particular product or service (or basket of products or services). Most charge controls are imposed for a defined period.

CMR: Ofcom's Communications Market Reports.

Competition and Markets Authority (CMA): An independent public body that brings together the previous role of the Competition Commission as well as many of the competition and consumer functions of the OFT.

Connected Nations Report: An annual report published by Ofcom the availability and quality of broadband across the UK.

Consumer Price Index (CPI): The official measure of inflation of consumer prices in the United Kingdom.

Core Network: The backbone of a communications network, which carries different services such as voice or data around the country.

D-side: Distribution side. The segment of BT's access network between the Primary Cross Connection Points (street cabinets) and Distribution Points.

DCMS: Department of Culture, Media and Sport.

Digital Subscriber Line (DSL): A family of technologies generically referred to as DSL, or xDSL used to add a broadband service to an existing phone line provided using a pair of copper wires (known as a twisted copper pair).

Digital Subscriber Line Access Multiplexer (DSLAM): A network device, located in a telephone exchange or street cabinet that provides broadband services to multiple premises over the copper access network using DSL technologies.

Distribution Point (DP): A flexibility point in BT's access network where final connections to customer premises are connected to D-side cables. Usually either an underground joint or a connection point on a telegraph pole where dropwires are terminated.

Downstream BT: BT's downstream operations, by which we mean BT Consumer or any other downstream operation owned or operated by BT.

Duct and Pole Access (DPA): A wholesale access service allowing a telecoms provider to make use of the underground duct network and the telegraph poles of another telecoms provider.

Ducts: Underground pipes which hold copper and fibre lines.

E-side: Exchange side. The segment of BT's access network between telephone exchanges and Primary Cross Connection Points (street cabinets).

EC: European Commission.

Equivalence of Input (EOI): A remedy designed to prevent a vertically-integrated company from discriminating between its competitors and its own business in providing upstream inputs. This requires BT to provide the same wholesale products to all telecoms providers 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 telecoms providers (including BT) of the same commercial information about such products, services, systems and processes.

Ethernet: A packet-based technology originally developed for use in Local Area Networks (LANs) but now also widely used in telecoms providers' network for the transmission of data services.

FAMR: Fixed Access Market Review.

Fibre to the Cabinet (FTTC): An access network structure in which the optical fibre extends from the exchange to a street cabinet. The street cabinet is usually located only a few hundred metres from the subscriber's premises. The remaining part of the access network from the cabinet to the customer is usually copper wire but could use another technology, such as wireless.

Fibre to the Premises (FTTP): An access network structure in which the optical fibre network runs from the local exchange to the customer's house or business premises. The optical fibre may be point-to-point – there is one dedicated fibre connection for each home – or may use a shared infrastructure such as a GPON. Sometimes also referred to as Fibre to the home (FTTH), or full-fibre.

Fixed wireless: An access service where the connection between the network and the equipment located at the customer premises is provided over the radio access medium.

Full Time Equivalent (FTE): A measure of resources or work, defined by reference to the capacity of a full time employee. An FTE of 1 is equivalent to one full time employee.

Fully allocated cost (FAC): An accounting approach under which all the costs of the company are distributed between its various products and services. The fully allocated cost of a product or service may therefore include some common costs that are not directly attributable to the service.

G.fast: A DSL standard that supports higher bandwidth transmissions than ADSL and VDSL technologies over short copper lines.

Generic Ethernet Access (GEA): BT's wholesale service providing telecoms providers with access to BT's FTTC and FTTP networks in order to supply higher speed broadband services. BT currently meets its obligation to provide VULA using the GEA service.

Gigabit Passive Optical Network (GPON): A fibre access network architecture where part of the network is shared by multiple customers.

Hull Area: The area defined as the 'Licensed Area' in the licence granted on 30 November 1987 by the Secretary of State under Section 7 of the Telecommunications Act 1984 to Kingston upon Hull City Council and Kingston Communications (Hull) plc (KCOM). It consists of the Kingston upon Hull Council area and some parts of the East Riding of Yorkshire Council area.

Internet Protocol (IP): Packet data protocol used for routing and carriage of messages across the internet and similar networks.

Internet Service Provider (ISP): An organisation that provides internet access services.

Latency: A measure of delay in a telecommunications network, typically the transmission time for a packet of data to traverse the network.

Leased Line: A permanently connected communications link between two premises dedicated to the customer's exclusive use.

Local Loop: The access network connection between the customer's premises and the local serving exchange, usually comprised of two copper wires twisted together.

Local Loop Unbundling (LLU): A process by which a dominant provider's local loops are physically disconnected from its network and connected to a competing provider's networks. This enables operators other than the incumbent to use the local loop to provide services directly to customers.

Long Reach VDSL (LR-VDSL): LR-VDSL uses VDSL technology but makes use of the frequency ranges assigned to both ADSL and VDSL, and utilises higher signal power. LR-VDSL also uses vectoring to minimise the impact of cross-talk and interference, which would otherwise reduce the speed available to customers.

Main Distribution Frame (MDF): An internal wiring frame where local loops are terminated and connected to exchange equipment by jumpers.

Metallic Path Facility (MPF): The provision of access to the copper wires from the customer premises to a BT MDF that covers the full available frequency range, including both narrowband and broadband channels, allowing a competing provider to provide the customer with both voice and/or data services over such copper wires.

Modified Greenfield Approach: An approach to analysing markets, where we consider a hypothetical scenario in which there are no ex ante SMP remedies in the market being considered or in any markets downstream of it.

Next Generation Access (NGA) Networks: Wired access networks which consist wholly or in part of optical elements and which are capable of delivering broadband access services with enhanced characteristics (such as higher throughput) as compared to those provided over copper access

networks. In most cases, NGAs are the result of an upgrade of an already existing copper or co-axial access network.

Next Generation Network (NGN): A network that uses IP technology in the core and backhaul to provide all services over a single platform.

NMR: Narrowband Market Review.

NRA: National Regulatory Authority.

Ofcom: The Office of Communications.

ONS: The Office of National Statistics.

Openreach: The access division of BT established by Undertakings in 2005.

Physical Infrastructure Access (PIA): A regulatory obligation under which BT is required to allow telecoms providers to deploy NGA networks in the physical infrastructure of its access network.

Primary Cross Connection Point (PCP): A street cabinet (or equivalent facility) located between the customer's premises and BT's local serving exchanges, which serves as an intermediary point of aggregation for BT's copper network.

Regulatory Financial Statements (RFS): The financial statements that BT is required to prepare by Ofcom. They include the published RFS and Additional Financial Information provided to Ofcom in confidence.

Shared Metallic Path Facility (SMPF)/Shared Access: The provision of access to the copper wires from the customer's premises to a BT MDF that allows a competing provider to provide the customer with broadband services, while BT continues to provide the customer with conventional narrowband communications.

Significant market power (SMP): The significant market power test is set out in European Directives. It is used by national regulatory authorities (NRAs), such as Ofcom, to identify those telecoms providers which must meet additional obligations under the relevant Directives.

Small and Medium Sized Enterprises (SME): Businesses with 249 or fewer employees.

Standard broadband (SBB): A broadband connection that can support a maximum download speed of less than 30Mb/s.

Statement of Requirements (SoR): A mechanism by which telecoms providers can request KCOM to provide a service, which should meet guidelines published by KCOM on information required for it to consider the request.

Strategic Review of Digital Communications: Also referred to as the Digital Communications Review (DCR), is a document Ofcom published in February 2016 which set out a ten-year vision for communications services in the UK.

Sub-Loop Unbundling (SLU): Like local loop unbundling (LLU), except that telecoms providers interconnect at a point between the exchange and the customer, usually at the cabinet.

Superfast Broadband (SFBB): A broadband connection that can support a maximum download speed of between 30Mbit/s and 300Mbit/s.

Telecoms provider: A person who provides an electronic communications network or provides an electronic communications service.

The Act: The Communications Act 2003.

Ultrafast Broadband (UFBB): Broadband services which delivers headline download speeds greater than 300Mbit/s.

USO: Universal Service Obligation.

Vectoring: A performance improvement technique that reduces the effect of crosstalk on copper lines. It is based on the concept of noise cancellation via the co-ordination of line signals.

Very-high-bit-rate digital subscriber line (VDSL): DSL technologies offering superfast broadband speeds. On Openreach's FTTC network which uses VDSL technology, services of up to 80Mb/s downstream and 20Mb/s upstream are currently offered. VDSL, in this Consultation, refers to all generations of the technology.

Virtual Local Area Network: A subdivision of the capacity within the network allowing individual traffic streams to be managed. VLANs are used within Openreach's GEA service to separate each user's data traffic through the Openreach network.

Virtual Unbundled Local Access (VULA): A regulatory obligation requiring BT to provide access to its FTTC and FTTP network deployments which allows telecoms providers to connect at a 'local' aggregation point and are provided a virtual connection from this point to the customer premises.

Voice over Internet Protocol (VoIP): The method of carrying voice calls on fixed and mobile networks by packetizing speech and carrying it using IP.

Weighted Average Cost of Capital (WACC): The cost of funds used for financing a business.

Wholesale Broadband Access (WBA): The WBA market concerns the wholesale broadband products that Telecoms Providers provide for themselves and sell to each other.

Wholesale Line Rental (WLR): The service offered by Openreach to other telecoms providers to enable them to offer retail line rental services in competition with BT's own retail services.

Wholesale Local Access (WLA): The market that covers fixed telecommunications infrastructure, specifically the physical connection between customers' premises and a local exchange.

A3. Regulatory framework

A3.1 This annex provides an overview of the market review process to give some additional context to the matters discussed in this statement, including the legal instruments published at Annex 1.

A3.2 Market review regulation is technical and complex, and requires us to apply legislation and take into account a number of relevant recommendations and guidelines. This overview identifies some of the key aspects of materials relevant to this market review but does not purport to give a full and exhaustive account of all materials that we have considered in reaching our decisions on these markets.

Market review concept

A3.3 A market review is a process by which, at regular intervals, we identify relevant markets appropriate to national circumstances and carry out analyses of these markets to determine whether they are effectively competitive. Where an operator has significant market power (SMP) in a market, we impose appropriate remedies, known as SMP obligations or conditions, to address this. We explain the concept of SMP below.

A3.4 In carrying out this work, we act in our capacity as the sector-specific regulator for the UK communications industries, including telecommunications. Our functions in this regard are to be found in Part 2 of the Act.[1] We exercise those functions within the framework harmonised across the European Union for the regulation of electronic communications by the Member States (known as the Common Regulatory Framework or the 'CRF'), as transposed by the Act. The applicable rules[2] are contained in a package of five EC Directives, of which two Directives are particularly relevant for present purposes, namely:

- Directive 2002/21/EC on a common regulatory framework for electronic communications networks and services (the 'Framework Directive');[3] and
- Directive 2002/19/EC on access to, and interconnection of, electronic communications networks and associated facilities (the 'Access Directive').[4]

A3.5 The Directives require that NRAs (such as Ofcom) carry out reviews of competition in communications markets to ensure that SMP regulation remains appropriate and proportionate in light of changing market conditions.

A3.6 Each market review normally involves three analytical stages, namely:

- the identification and definition of the relevant markets (the market definition procedure);

[1] http://www.legislation.gov.uk/ukpga/2003/21/contents.
[2] 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 statement to the Act should be read accordingly.
[3] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32002L0021&from=en.
[4] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32002L0019&from=EN.

- the assessment of competition in each market, in particular whether the relevant market is effectively competitive (the market analysis procedure); and
- the assessment of appropriate regulatory obligations (the remedies procedure).

A3.7 These stages are normally carried out together.

Market definition procedure

A3.8 The Act provides that, before making a market power determination,[5] we must identify "*the markets which in [our] opinion, are the ones which in the circumstances of the United Kingdom are the markets in relation to which it is appropriate to consider whether to make such a determination*" and analyse those markets.[6]

A3.9 The Framework Directive requires that NRAs shall, taking the utmost account of the 2014 EC Recommendation[7] and EC SMP Guidelines[8] published by the European Commission, define the relevant markets appropriate to national circumstances, in particular relevant geographic markets within their territory, in accordance with the principles of competition law.[9]

A3.10 The 2014 EC Recommendation identifies a set of product and service markets within the electronic communications sector in which *ex ante* regulation may be warranted. Its purpose is twofold. First, it seeks to achieve harmonisation across the single market by ensuring that the same markets will be subject to a market analysis in all Member States. Second, the 2014 EC Recommendation seeks to provide legal certainty by making market players aware in advance of the markets to be analysed.

A3.11 However, NRAs are able to regulate markets that differ from those identified in the 2014 EC Recommendation where this is justified by national circumstances by demonstrating that three cumulative criteria referred to in the 2014 EC Recommendation (the three-criteria test) are satisfied and where the EC does not raise any objections.

A3.12 The three criteria, which are cumulative, are:

- the presence of high and non-transitory structural, legal or regulatory barriers to entry;

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[5] The market power determination concept is used in the Act to refer to a determination that a person has SMP in an identified services market.
[6] Section 79 of the Act.
[7] 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, (2014/710/EU), available at http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2014.295.01.0079.01.ENG. Together with this Recommendation, the Commission has adopted an Explanatory Note, available at: http://ec.europa.eu/information_society/newsroom/cf/dae/document.cfm?action=display&doc_id=7056.
[8] European Commission guidelines on market analysis and the assessment of significant market power under the EU regulatory framework for electronic communications networks and services (2018/C 159/01), https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1528453322518&uri=CELEX:52018XC0507(01). Together with these Guidelines, the Commission has adopted an Explanatory Note, available at: https://ec.europa.eu/digital-single-market/en/news/staff-working-document-guidelines-market-analysis-and-assessment-smp-under-eu-regulatory.
[9] Article 15(3) of the Framework Directive.

- a market structure which does not tend towards effective competition within the relevant time horizon, having regard to the state of infrastructure-based and other competition behind the barriers to entry; and
- competition law alone is insufficient to adequately address the identified market failure(s).

A3.13 The fact that an NRA identifies the product and service markets listed in the 2014 EC Recommendation or identifies other product and service markets that meet the three-criteria test does not automatically mean that regulation is warranted. Market definition is not an end in itself but rather a means of assessing effective competition.

A3.14 The relationship between the market definitions identified in this review and those listed in the 2014 EC Recommendation is discussed in relevant parts of this Statement.[10]

A3.15 The EC SMP Guidelines make clear that market definition is not a mechanical or abstract process. It requires an analysis of any available evidence of past market behaviour and an overall understanding of the mechanics of a given market sector.[11] To undertake the forward-looking structural evaluation of the relevant market, the EC SMP Guidelines state that NRAs should determine whether the underlying retail market is prospectively competitive, and thus whether any lack of effective competition is durable, by taking into account expected or foreseeable market developments over the course of the review period in the absence of regulation based on significant market power (known as a 'Modified Greenfield Approach').[12]

A3.16 The EC SMP Guidelines also describe how competition law methodologies should be used by NRAs in their analysis. In particular, there are two dimensions to the definition of a relevant market: the relevant products to be included in the same market and the geographic extent of the market. Ofcom's approach to market definition follows that used by the UK competition authorities, which is in line with the approach adopted by the European Commission and applicable jurisprudence of the Court of Justice of the European Union.

A3.17 While competition law methodologies are used in identifying the relevant markets *ex ante*, the EC SMP Guidelines note that, given the differences in scope and objectives in intervention, markets defined for the purposes of EU competition law and those defined for the purposes of sector-specific regulation may not always be identical.[13] Similarly, the designation of an undertaking as having significant market power in a market identified for the purposes of *ex ante* regulation does not automatically imply that it will also be dominant for the purposes of *ex post* competition law.[14] This may be the case, especially as the former is based on an overall forward-looking assessment of the structure and the

[10] See, in particular paragraph 2.37.
[11] EC SMP Guidelines, paragraph 25.
[12] EC SMP Guidelines, paragraphs 13-17. The EC SMP Guidelines provide that the actual period used should reflect the expected timing for the next review of the relevant market by the NRA – see paragraph 14 and footnote 11.
[13] EC SMP Guidelines, paragraph 10.
[14] EC SMP Guidelines, paragraph 11.

functioning of the market under examination. Accordingly, the economic analysis carried out for the purpose of this review, including the markets we have identified, is without prejudice to any analysis that may be carried out in relation to any investigation pursuant to the Competition Act 1998[15] (relating to the application of the Chapter I or II prohibitions or Article 101 or 102 of the Treaty on the Functioning of the European Union[16]) or the Enterprise Act 2002.[17]

Market analysis procedure

Effective competition

A3.18 The Act requires that we carry out market analyses of identified markets for the purpose of making or reviewing market power determinations. Such analyses are normally to be carried out within two years from the adoption of a revised recommendation on markets, where that recommendation identifies a market not previously notified to the EC, or within three years from the publication of a previous market power determination relating to that market.[18] Exceptionally, the three-year period may be extended for up to three additional years where the NRA notifies the EC, and it does not object.

A3.19 In carrying out a market analysis, the key issue for an NRA is to determine whether the market in question is effectively competitive. The 27th recital to the Framework Directive clarifies the meaning of that concept:

> *"[it] is essential that ex ante regulatory obligations should only be imposed where there is not effective competition, i.e. in markets where there are one or more undertakings with significant market power, and where national and Community competition law remedies are not sufficient to address the problem*".

A3.20 An undertaking is deemed to have SMP if it enjoys a position equivalent to dominance as defined in *ex post* competition law.[19] In essence, it means that an 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. The Framework Directive requires that NRAs must carry out their market analysis taking the utmost account of the EC SMP Guidelines, which emphasise that NRAs should undertake a thorough and overall analysis of the economic characteristics of the relevant market before coming to a conclusion as to the existence of SMP.

A3.21 In that regard, the EC SMP Guidelines set out, additionally to market shares, a number of criteria that can be used by NRAs to measure the power of an undertaking to behave to an appreciable extent independently of its competitors, customers and consumers, including:

- barriers to entry;

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[15] http://www.legislation.gov.uk/ukpga/1998/41/contents.
[16] Previously Article 81 and Article 82 of the EC Treaty, http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:C:2010:083:FULL:EN:PDF.
[17] http://www.legislation.gov.uk/ukpga/2002/40/contents.
[18] Section 84A of the Act.
[19] Article 14 and recital 25 of the Framework Directive, implemented by section 78 of the Act.

- barriers to expansion;
- absolute and relative size of the undertaking;
- control of infrastructure not easily duplicated;
- technological and commercial advantages or superiority;
- absence of or low countervailing buying power;
- easy or privileged access to capital markets/financial resources;
- product/services diversification (e.g. bundled products or services);
- economies of scale;
- economies of scope;
- direct and indirect network effects;
- vertical integration;
- a highly developed distribution and sales network;
- conclusion of long-term and sustainable access agreements;
- engagement in contractual relations with other market players that could lead to market foreclosure; and
- absence of potential competition.

A3.22 SMP can derive from a combination of these criteria, which when taken separately may not necessarily be determinative.

Sufficiency of competition law

A3.23 As part of our overall forward-looking analysis, we also assess whether competition law by itself (without *ex ante* regulation) is sufficient, within the relevant markets we have defined, to address the competition problems we have identified. We consider this matter in our assessment of the appropriate remedies which, as explained below, are based on the nature of the specific competition problems we identify within the relevant markets as defined.

A3.24 In considering this matter, we bear in mind the specific characteristics of the relevant markets we have defined. 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 effective competition might not be possible if the regulator relied solely on *ex post* competition law powers which are not specifically tailored to the sector. Therefore, it may be appropriate for *ex ante* regulation to be used to address these market failures along with any entry barriers that might otherwise prevent effective competition from becoming established within the relevant markets we have defined. By imposing *ex ante* regulation that promotes competition, it may be possible to reduce such regulation over time, as markets become more competitive, allowing greater reliance on *ex post* competition law.

A3.25 *Ex post* competition law is also unlikely in itself to bring about (or promote) effective competition, as it prohibits the abuse of dominance rather than the holding of a dominant position itself. In contrast, *ex ante* regulation is normally aimed at actively promoting the development of competition through attempting to reduce the level of market power (or dominance) in the identified relevant markets, thereby encouraging the establishment of effective competition.

A3.26 We generally take the view that *ex ante* regulation provides additional legal certainty for the market under review and may also better enable us to intervene in a timely manner. We may also consider that certain obligations are needed as competition law would not remedy the particular market failure(s), or that the specific clarity and detail of the obligation is required to achieve a particular result.

Remedies procedure

Powers and legal tests

A3.27 The Framework Directive prescribes what regulatory action NRAs must take depending upon whether or not an identified relevant market has been found effectively competitive. Where a market has been found effectively competitive, NRAs are not allowed to impose SMP obligations and must withdraw such obligations where they already exist. On the other hand, where the market is found not effectively competitive, the NRAs must identify the undertakings with SMP in that market and then impose appropriate obligations.[20]

A3.28 NRAs have a suite of regulatory tools at their disposal, as reflected in the Act and the Access Directive. Specifically, the Access Directive specifies a number of SMP obligations, including transparency, non-discrimination, accounting separation, access to and use of specific network elements and facilities, price control and cost accounting. When imposing a specific obligation, the NRA will need to demonstrate that the obligation in question is based on the nature of the problem identified, proportionate and justified in the light of the policy objectives as set out in Article 8 of the Framework Directive.[21]

A3.29 Specifically, for each and every SMP obligation, we explain why it satisfies the requirement in section 47(2) of the Act that the obligation is:

- objectively justifiable in relation to the networks, services, facilities, apparatus or directories to which it relates;
- not such so as to discriminate unduly against particular persons or against a particular description of persons;
- proportionate to what the condition or modification is intended to achieve; and
- transparent in relation to what is intended to be achieved.[22]

A3.30 Additional legal requirements may also need to be satisfied depending on the SMP obligation in question.[23] For example, in the case of price controls, the NRA's market analysis must indicate that the lack of effective competition means that the telecoms provider concerned may sustain prices at an excessively high level, or may apply a price squeeze, to the detriment of end-users and that the setting of the obligation is appropriate for the purposes of promoting efficiency, promoting sustainable competition and conferring the greatest possible benefits on the end-users of public electronic

[20] Article 16(3) and (4) of the Framework Directive; sections 84 and 87(1) of the Act.
[21] Article 8(4) of the Access Directive.
[22] Section 47 of the Act; Article 8(5) of the Framework Directive and Article 5(2) of the Access Directive.
[23] As set out in sections 87 - 91 of the Act.

communications services. In that instance, NRAs must take into account the investment made by the telecoms provider and allow it a reasonable rate of return on adequate capital employed, taking into account any risks specific to a particular new investment, as well as ensure that any cost recovery mechanism or pricing methodology that is mandated serves to promote efficiency and sustainable competition and maximise consumer benefits.[24]

A3.31 Where an obligation to provide third parties with network access is considered appropriate, NRAs must take into account factors including the feasibility of the proposed network access, the technical and economic viability of creating networks (including the viability of other network access products, whether provided by the dominant provider or another person) that would make the network access unnecessary, the investment of the network operator who is required to provide access (taking account of any public investment made), and the need to secure effective competition (including, where it appears to us to be appropriate, economically efficient infrastructure-based competition) in the long term.[25]

A3.32 To the extent relevant to this review, we demonstrate the application of these legal tests to the particular SMP obligations we have decided to impose in the relevant parts of this document which set out our decisions on remedies. In doing so, we also assess how the performance of our general duties under section 3 of the Act is secured or furthered by our regulatory intervention, and that it is in accordance with the six Community requirements in section 4 of the Act. This is also relevant to our assessment of the likely impact of implementing our conclusions.

Ofcom's general duties – section 3 of the Act

A3.33 Under the Act, our principal duty in carrying out our 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 (section 3(1)).

A3.34 In doing so, we are required to secure a number of specific objectives and to have regard to a number of matters set out in section 3 of the Act.

A3.35 In performing our duties, we are also required to have regard to a range of other considerations, as appear to us to be relevant in the circumstances. In this context, we consider that a number of such considerations are relevant, in particular:

- the desirability of promoting competition in relevant markets (section 3(4)(b));
- the desirability of encouraging investment and innovation in relevant markets (section 3(4)(d)); and
- the desirability of encouraging the availability and use of high speed data transfer services throughout the UK (section 3(4)(e).

A3.36 We must also have regard to the principles under which regulatory activities should be transparent, accountable, proportionate, consistent, and targeted only at cases in which

[24] Section 88 of the Act, which implements Article 13 of the Access Directive.
[25] Section 87 of the Act.

action is needed (section 3(3)), as well as the interest of consumers in respect of choice, price, quality of service and value for money (section 3(5)).

A3.37 Ofcom has, however, a wide measure of discretion in balancing its statutory duties and objectives. In doing so, we take account of all relevant considerations, including responses received during our consultation process, in reaching our conclusions.

European Community requirements for regulation – sections 4 and 4A of the Act and Article 3 of the BEREC Regulation

A3.38 As noted above, our functions exercised in this review fall under the CRF. As such, section 4 of the Act requires us to act in accordance with the six European Community requirements for regulation.

A3.39 In summary, these six requirements are:

- to promote competition in the provision of electronic communications networks and services, associated facilities and the supply of directories;
- to contribute to the development of the European internal market;
- to promote the interests of all persons who are citizens of the 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 (i.e. to be technologically neutral);
- to encourage, to such extent as Ofcom considers appropriate for certain prescribed purposes, the provision of network access and service interoperability, namely securing efficient and sustainable competition, efficient investment and innovation, and the maximum benefit for customers of telecoms providers; and
- to encourage compliance with certain standards in order to facilitate service interoperability and secure freedom of choice for the customers of telecoms providers.

A3.40 We considered that the first, third, fourth and fifth of those requirements are of particular relevance to the matters under review and that no conflict arises in this regard with those specific objectives in section 3 of the Act that we consider are particularly relevant in this context.

A3.41 Section 4A of the Act requires Ofcom, in carrying out certain of its functions (including, among others, Ofcom's functions in relation to market reviews under the CRF) to take due account of applicable recommendations issued by the EC under Article 19(1) of the Framework Directive. Where we decide not to follow such a recommendation, we must notify the EC of that decision and the reasons for it.

A3.42 Further, Article 3(3) of the Regulation establishing BEREC[26] requires NRAs to take utmost account of any opinion, recommendation, guidelines, advice or regulatory best practice adopted by BEREC.

A3.43 Accordingly, we have taken due account of the applicable EC recommendations, and utmost account of the applicable opinions, recommendations, guidelines, advice and regulatory best practices adopted by BEREC relevant to the matters under consideration in this review.

Impact assessment – section 7 of the Act

A3.44 The analysis presented in the consultation documents leading to this statement represents an impact assessment, as defined in section 7 of the Act.

A3.45 Impact assessments provide a valuable way of assessing different options for regulation and showing why the preferred option was chosen. They form part of best practice policy-making. This is reflected in section 7 of the Act, which means that generally Ofcom has to carry out impact assessments where there is likely to be a significant effect on businesses or the general public, or when there is a major change in Ofcom's activities. However, as a matter of policy, Ofcom is committed to carrying out and publishing impact assessments in relation to the great majority of its policy decisions.[27]

A3.46 Specifically, pursuant to section 7, an impact assessment must set out how, in our opinion, the performance of our general duties (within the meaning of section 3 of the Act) is secured or furthered by or in relation to the regulation we impose.

A3.47 Ofcom is separately required by statute to assess the potential impact of all our functions, policies, projects and practices on race, disability and gender equality. This assessment is set out in Annex [6].

Regulated entity

A3.48 The power in the Act to impose an SMP obligation by means of an SMP services condition provides that it is to be applied only to a 'person' whom we have determined to be a 'person' having SMP in a specific market for electronic communications networks, electronic communications services or associated facilities (i.e. the 'services market').

A3.49 The Framework Directive requires that, where an NRA determines that a relevant market is not effectively competitive, it shall identify 'undertakings' with SMP on that market and impose appropriate specific regulatory obligations. For the purposes of EU competition

[26] Regulation (EC) No 1211/2009 of the European Parliament and of the Council of 25 November 2009 establishing the Body of European Regulators of Electronic Communications (BEREC) and the Office (the BEREC Regulation), http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2009:337:0001:0010:EN:PDF.

[27] For further information about Ofcom's approach to impact assessments, see the guidelines, *Better policy-making: Ofcom's approach to impact assessment*, which are on the Ofcom website: http://stakeholders.ofcom.org.uk/binaries/consultations/better-policy-making/Better_Policy_Making.pdf.

law, 'undertaking' includes companies within the same corporate group (for example, where a company within that group is not independent in its decision making).[28]

A3.50 We consider it appropriate to prevent a dominant provider to whom an SMP service condition is applied, which is part of a group of companies, exploiting the principle of corporate separation. The dominant provider should not use another member of its group to carry out activities or to fail to comply with a condition, which would otherwise render the dominant provider in breach of its obligations.

A3.51 To secure that aim, we apply the SMP conditions to the person in relation to which we have made the market power determination in question by reference to the so-called 'Dominant Provider', which we define as "*[X plc], whose registered company number is [000] and any [X plc] subsidiary or holding company, or any subsidiary of that holding company, all as defined in section 1159 of the Companies Act 2006*".

[28] Case C-73/95 P, *Viho v Commission*, [1996] ECR I-5447, http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:61995CJ0073:EN:PDF.

A4. General analytical approach to market definition and SMP assessment

A4.1 This annex sets out in general terms the processes that we have followed in defining the markets within this review, and how and on what basis we assess whether any operator has SMP in a given market. Sections 3, 4 and 5 (product market definition, geographic market definition and SMP analysis respectively) set out in more detail how we have applied our analytical approach in the WBA market.

Overview of approach

A4.2 The market review procedure requires us to analyse markets in order to determine whether they are effectively competitive, and then to decide on appropriate remedies if necessary. Before an assessment of competitive conditions is possible it is necessary to define the relevant market.

A4.3 The definition of the relevant market does not simply entail identifying services that resemble each other in some way, but the set of services (and geographical areas) that exercise a sufficiently strong competitive constraint on each other. It therefore has two dimensions:

- the relevant products or services to be included within the market; and
- the geographic extent of the market.

A4.4 It is often practical to define the relevant product market before exploring the geographic dimension of the market.

A4.5 The market definition exercise is not an end in itself, but a means to assessing whether there is effective competition and thus whether there is a need for *ex ante* regulation. It is in this light that we have conducted our market definitions in this review.

2014 EC Recommendation and the three-criteria test

A4.6 As explained in Annex 3, in defining markets for market review purposes, we are required to define relevant markets appropriate to national circumstances in accordance with the principles of competition law. In doing so we have taken due account of the 2014 EC Recommendation, the accompanying Explanatory Note and the EC SMP Guidelines.

A4.7 As also explained in Annex 3, the 2014 EC Recommendation identifies a set of product and service markets within the electronic communications sector in which *ex ante* regulation may be warranted. NRAs may also identify markets that differ from those in the 2014 EC Recommendation which may be susceptible to *ex ante* regulation having regard to the three-criteria test.

A4.8 The three-criteria test is related to the assessment of SMP and involves the assessment of similar evidence but is analytically distinct. The three-criteria test focuses on overall market characteristics and structure, for the sole purpose of identifying those markets that are

susceptible to *ex ante* regulation. In contrast, assessment of SMP involves determining whether an operator active in a market that has been identified as being susceptible to *ex ante* regulation should be made subject to *ex ante* regulation.[29]

The time period under review

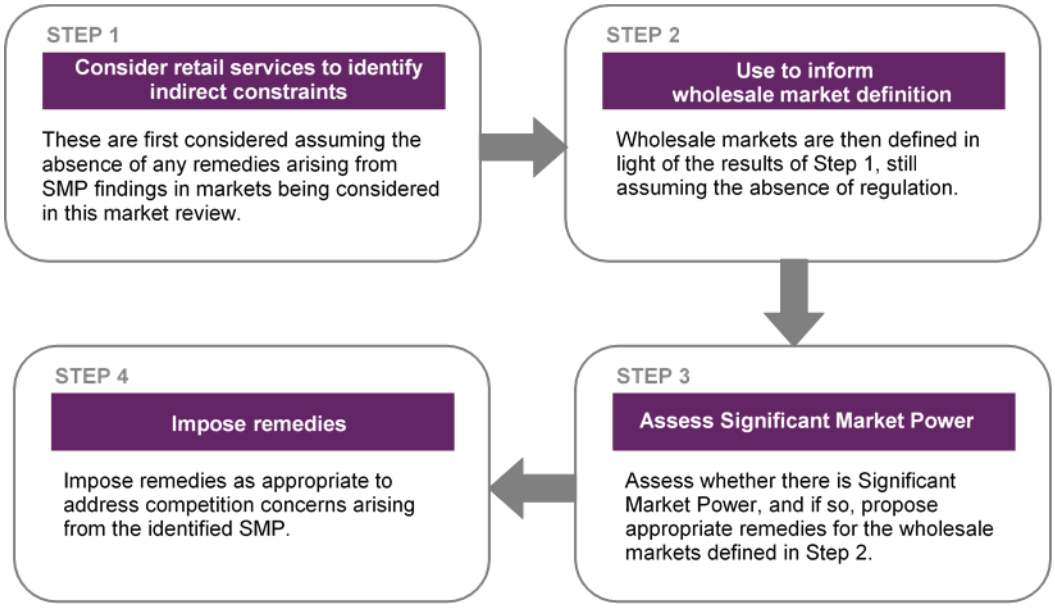
A4.9 Rather than just looking at the current position, market reviews look ahead to how competitive conditions may change in future. Our evaluation of the current market takes into account past developments and evidence, before then considering the foreseeable market changes that we expect to affect its development over the period up to 2021. This forward-looking period reflects the period covered by this market review.[30]

A4.10 The forward look period that we have used does not preclude us reviewing the market before that point should the market develop in a way we have not foreseen, to the extent that it is likely to affect the competitive conditions that are operating.

Market review process

A4.11 The market review process can be characterised as having four stages, which are shown in Figure A4.1 below.

Figure A4.1: Sequencing of market definition, SMP and remedies analysis



Source: Ofcom

A4.12 These steps are explained further in the following sub-sections.

[29] See the Commission Explanatory Note accompanying the 2014 EC Recommendation.
[30] We will carry out and notify the next review in line with our obligations under the EU Framework and the Act.

Market definition

A4.13 The starting point for identifying markets which may be susceptible to *ex ante* regulation is the consideration of retail services from a forward-looking perspective.[31] The wholesale market is defined subsequent to this exercise being carried out. In relevant cases we then consider whether the wholesale market is one in which *ex ante* regulation may be appropriate (if so, we have then formally identified a relevant market).[32]

A4.14 Consideration of retail services is logically prior to wholesale market definition because the demand for the upstream wholesale service is a derived demand, meaning that the level of the demand for the upstream input depends on the demand for the retail service.

A4.15 This link between the retail and wholesale level means that the range of available substitutes at the downstream (e.g. retail) level will inform the likely range of competitive constraints acting at the upstream (e.g. wholesale) level. This is because a rise in the price of a wholesale service which is passed through to the price of retail services may cause retail customers to switch to substitute retail services, reducing demand for the wholesale input. We refer to this as an indirect constraint.

A4.16 Consequently, the analysis of the retail and wholesale levels of the supply-chain should be regarded as one exercise, the ultimate purpose of which is to define those wholesale markets in the UK where there may be a requirement for the imposition of *ex ante* regulation.[33]

Demand-side and supply-side substitution

A4.17 The boundaries between markets are determined by identifying competitive constraints on the price setting behaviour of firms. There are two main constraints to consider:[34]

- to what extent it is possible for a customer to substitute other services for those in question in response to a relative price increase (demand-side substitution); and
- to what extent suppliers can switch, or increase, production to supply the relevant products or services in response to a relative price increase (supply-side substitution).

A4.18 The hypothetical monopolist test (HMT) is a tool which can be used to identify close demand-side and supply-side substitutes.[35] In this test, a product is considered to constitute a separate market if the hypothetical monopolist supplier could impose a small

[31] See, in this respect, recital 7 of the 2014 EC Recommendation which states that "*the starting point for the identification of wholesale markets susceptible to ex ante regulation is the analysis of corresponding retail markets*". See also Section 2.1 of the Explanatory Note to the 2014 EC Recommendation and paragraphs 15 and 26 of the SMP Guidelines.
[32] See recital 5 and point 2 of the 2014 EC Recommendation.
[33] See paragraph 2.1 of the Explanatory Note to the 2014 EC recommendation which states that "market definition…is the prerequisite for assessing whether a particular market is characterised by effective competition or should be subject to *ex ante* regulation" and paragraph 24 of the EC SMP Guidelines which notes that "the objective of market definition is not an end in itself, but part of a process, namely assessing the degree of an undertaking's market power".
[34] See paragraph 27 of the EC SMP Guidelines, which also notes that potential competition also acts as a third source of competitive constraint on an operator's behaviour but is taken into account in the SMP assessment.
[35] See paragraph 29 of the EC SMP Guidelines.

but significant non-transitory increase in price (SSNIP) above the competitive level without losing sales to such a degree as to make this price rise unprofitable. If such a price rise would be unprofitable, because consumers would switch to other products or because suppliers of other products would begin to compete with the hypothetical monopolist, then the market definition should be expanded to include the substitute products.

A4.19 We must first therefore address the issue of which product(s) should form the starting point for the application of the HMT. This starting point can be referred to as the 'focal product',[36] and typically starts from the narrowest potential market definition.[37]

A4.20 Having considered demand-side substitution we then, where relevant, assess supply-side substitution possibilities to consider whether they provide any additional constraints on the pricing behaviour of the hypothetical monopolist which have not been captured by the demand-side analysis. In this assessment, supply-side substitution is considered to be a low-cost form of entry which can take place within a reasonable timeframe (e.g. up to 12 months).

A4.21 For supply-side substitution to be relevant not only must suppliers be able, in theory, to enter the market quickly and at low cost by virtue of their existing position in the supply of other products or geographic areas, but there must also be an additional competitive constraint arising from such entry into the supply of the service in question.

A4.22 Therefore, in identifying potential supply-side substitutes, it is important that providers of these services have not already been taken into consideration. There might be suppliers who provide other services but who might also be materially present in the provision of demand-side substitutes to the service for which the hypothetical monopolist has raised its price. Such suppliers are not relevant to supply-side substitution since they supply services already identified as demand-side substitutes. However, the impact of expansion by such suppliers can be taken into account in the assessment of market power.

Relevance of existing regulation – the modified Greenfield approach

A4.23 When we conduct our analysis, we use the modified Greenfield approach.[38] This requires us to assess whether markets are effectively competitive from a forward-looking perspective in the absence of any regulation that would result from a finding of SMP. To do otherwise would be circular.

A4.24 However, it remains appropriate to take into account *ex ante* regulation arising from SMP findings in markets either upstream from, or horizontally related to, the services of interest.

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[36] This reflects the terminology used by the OFT (OFT, Market definition, December 2004, OFT403, www.oft.gov.uk/shared_oft/business_leaflets/ca98_guidelines/oft403.pdf).

[37] Paragraph 3.2 of the OFT Market Definition Guidelines explains that 'previous experience and common sense will normally indicate the narrowest potential market definition, which will be taken as the starting point for the analysis'.

[38] See Section 2.5 of the Explanatory Note to the 2014 EC Recommendation and paragraph 17 of the EC SMP Guidelines.

Bundling

A4.25 A common feature of the retail telecoms sector is the supply of bundles of different services. However, the Explanatory Note explains that the fact that bundling is a trend observed at the retail level does not require the definition of retail market(s) for bundles. This is because evidence to date has not indicated that there is a need for ex ante regulation of bundles, which may contain a previously regulated input.[39]

A4.26 The Explanatory Note goes on to explain that what matters in this regard is that:

> "*NRAs are able to ensure that the vertically integrated SMP operator's regulated elements of the bundle can be effectively replicated (in terms of both technical and economic replicability) at the retail level, without an implicit extension of regulation to other components which are available under competitive conditions*".

Aggregating markets

A4.27 In certain circumstances, it may also be appropriate to define a product or geographic market by grouping together services despite the absence of demand- and supply-side substitutability.

Homogeneity of competitive conditions

A4.28 Aggregating markets on the basis of the homogeneity of competitive conditions can help streamline the subsequent market power analysis by reducing the need to review multiple markets for products, the provision of which is subject to homogeneous competitive conditions.

A4.29 However, combining products and services based on homogenous competitive conditions, is – by definition – only appropriate where this would not substantively alter any subsequent findings of SMP (relative to defining those markets separately).

A4.30 Our approach also takes into account the EC SMP Guidelines. In particular, in the context of geographic market analysis, paragraph 48 states that:

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

A4.31 Hence, subject to the relevant caveats above, where there are products (or geographic areas) where competitive conditions are sufficiently homogeneous, the definition of the relevant market will include all of those products (or geographic areas) within one market.

Common pricing constraints

[39] See Section 3.2 of the Explanatory Note to the 2014 EC Recommendation.

A4.32 Another factor that is sometimes considered in setting market boundaries is whether there exist common pricing constraints across customers, services or geographic areas (for example, areas in which a firm voluntarily offers its services at a uniform price). Where common pricing constraints exist, the products or geographic areas in which they apply could be included within the same relevant market even if demand-side and supply-side substitution is limited (or absent). Failure to consider the existence of a common pricing constraint could lead to unduly narrow markets being defined.

Geographic market

A4.33 In addition to the product(s) to be included within a market, market definition requires us to specify the geographic extent of the market in which conditions of competition are sufficiently similar.

A4.34 One approach would be to begin with a narrowly defined geographic area and then consider whether a price increase by a hypothetical monopolist in that area would encourage customers to switch to suppliers located outside the area (demand-side substitution) or telecoms providers outside the area to begin to offer services in the area (supply-side substitution). If demand- and/or supply-side substitution is sufficient to constrain prices, then it is appropriate to expand the geographic market boundary.

A4.35 We recognise that in certain communications (product) markets, there may be different competitive conditions in different geographic areas. In such a case, we therefore have to consider whether it is appropriate to identify separate geographic markets for some services. Defining separate markets by geographic area may be problematic because, due to the dynamic nature of communications markets, the boundary between areas where there are different competitive pressures may be unstable and change over time.

A4.36 An alternative approach is to define geographic markets in a broader sense. This involves defining a single geographic market but recognising that this single market has local geographic characteristics. That is to say, recognising that within the single market there are geographic areas where competition is more developed than in other geographic areas. This avoids the difficulties of defining and remedying large numbers of markets and instability in the definition over time. Such an approach may also include the aggregation of markets as discussed above.

Market power assessment

A4.37 Having identified the relevant product and geographic market(s) and, where relevant having identified the market as susceptible to ex ante regulation, we go on to analyse each market in order to assess whether any person or persons have SMP as defined in section 78 of the Act (construed in accordance with Article 14 of the Framework Directive). Section 78 of the Act provides that SMP is defined as being equivalent to the competition law concept of dominance in accordance with Article 14(2) of the Framework Directive which provides:

> "*An undertaking shall be deemed to have significant market power if, either individually or jointly with others, it enjoys a position equivalent to dominance, that is to say a position of economic strength affording it the power to behave to an appreciable extent independently of competitors, customers and ultimately consumers*."

A4.38 Further, Article 14(3) of the Framework Directive states that:

> "*Where an undertaking has significant market power on a specific market, it may also be deemed to have significant market power on a closely related market, where the links between the two markets are such as to allow the market power held in one market to be leveraged into the other market, thereby strengthening the market power of the undertaking*."

A4.39 Therefore, in the relevant market, one or more undertakings may be designated as having SMP where that undertaking or undertakings enjoy a position of dominance. Also, an undertaking may be designated as having SMP where it could lever its market power from a closely related market into the relevant market, thereby strengthening its market power.

A4.40 In assessing whether an undertaking has SMP, we take due account of the SMP Guidelines as we are required to do under section 79 of the Act.

The criteria for assessing SMP

A4.41 The EC SMP Guidelines require NRAs to assess whether competition in a market is effective. This assessment is undertaken through a forward-looking evaluation of the market (i.e. determining whether the market is prospectively competitive), taking into account foreseeable developments and a number of relevant criteria.[40]

A4.42 Our assessments of SMP are concerned with the prospects for competition over the review period, namely the period between the end of the present review and the end of the next market review.[41] Ultimately, we want to understand how the markets are likely to develop, and whether competition is likely to be, or become, effective during this review period. Below we set out certain key factors that we are likely to consider when assessing SMP.[42]

A4.43 Where a market is found to be competitive then no SMP conditions can be imposed. Section 84(4) of the Act requires that any SMP condition in that market, applying to a person by reference to a market power determination made on the basis of an earlier analysis, must be revoked.

[40] See, for example, paragraphs 13-21 and paragraphs 52-58, of the EC SMP Guidelines.
[41] Article 16(6) of the Framework Directive, implemented in UK law by section 80A of the Act, currently states that NRAs shall notify the Commission of new draft measures within three years of the adoption of a previous measure relating to that market. See also paragraph 14 of the EC SMP Guidelines.
[42] The factors listed in this annex are not intended to be exhaustive and other evidence may be relevant.

Market shares

A4.44 In the EC SMP Guidelines, the EC discusses market shares as being an indicator of (although not sufficient to establish) market power:

> "…When considering the market power of an undertaking it is important to consider the market share of the undertaking and its competitors as well as constraints exercised by potential competitors in the medium term. Market shares can provide a useful first indication for the NRAs of the market structure and of the relevant importance of the various operators active on the market…
>
> According to established case-law, very large market share held by an undertaking for some time — in excess of 50 % — is in itself, save in exceptional circumstances, evidence of the existence of a dominant position. Experience suggests that the higher the market share and the longer the period of time over which it is held, the more likely it is that it constitutes an important preliminary indication of SMP.
>
> However, even an undertaking with a high market share may not be able to act to an appreciable extent independently of customers with sufficient bargaining strength."[43]

A4.45 Market shares and market share trends provide an indication of how competitive a market has been in the past. If a firm has a persistently high market share, then that in itself is evidence of SMP. However, changes in market share are also relevant to our assessment of prospects for competition. For example, a market share trend which shows a decline may suggest that competition will provide an effective constraint within the time period over which the SMP assessment is being conducted, although it does not preclude the finding of SMP.[44]

A4.46 In addition, if the market share is high, but below the 50% threshold, it is necessary to consider other key structural market features to assess SMP.[45] The EC SMP Guidelines and Explanatory Note to the EC SMP Guidelines note that dominance is not likely if the undertaking's market share is below 40% in the relevant market,[46] and the Explanatory Note to the EC SMP Guidelines also notes that an undertaking with a market share that does not exceed 25% is not likely to enjoy a (single) dominant position.[47]

Other factors affecting competitive constraints

A4.47 In addition to market shares, the EC SMP Guidelines set out a number of criteria that can be used by NRAs to measure the power of an undertaking to behave to an appreciable extent independently of its competitors, customers and consumers, including:[48]

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[43] EC SMP Guidelines, paragraphs 54-56.
[44] EC SMP Guidelines, paragraph 56.
[45] EC SMP Guidelines, paragraph 57.
[46] EC SMP Guidelines, footnote 55 and Explanatory Note to the EC SMP Guidelines, page 23.
[47] Explanatory Note to the EC SMP Guidelines, footnote 78.
[48] EC SMP Guidelines, paragraph 58.

- barriers to entry;
- barriers to expansion;
- absolute and relative size of the undertaking;
- control of infrastructure not easily duplicated;
- technological and commercial advantages or superiority;
- absence of or low countervailing buying power;
- easy or privileged access to capital markets/financial resources;
- product/services diversification (e.g. bundled products or services);
- economies of scale;
- economies of scope;
- direct and indirect network effects;
- vertical integration;
- a highly developed distribution and sales network;
- conclusion of long-term and sustainable access agreements;
- engagement in contractual relations with other market players that could lead to market foreclosure; and
- absence of potential competition.

A4.48 SMP can derive from a combination of these criteria, which when taken separately may not necessarily be determinative.

A4.49 An SMP analysis may also take into account the extent to which products or services within the market are differentiated. The constraint from products or services outside the relevant market may also be a relevant factor.

Excessive pricing and profitability

A4.50 In a competitive market, individual firms should not be able to persistently raise prices above costs and sustain excess profits.

A4.51 The ability, therefore, to price at a level that keeps profits persistently and significantly above the competitive level is an important indicator of market power. Factors that may explain excess profits in the short term, such as greater innovation and efficiency, or unexpected changes in demand, should however be considered in interpreting high profit figures.

A4.52 However, consistently low profits, i.e. profits at or below the cost of capital, cannot be taken as evidence of an absence of market power. It may simply be evidence of inefficiency. For example, if a firm with SMP were to have inefficiently high costs, it may charge a price above the level we would expect to see in a competitive market, but this would not result in high profits. In addition, price regulation exists in many of the wholesale markets considered, and therefore low profits may simply be the result of existing regulation rather than a reflection of the underlying competitive conditions.

Barriers to entry and expansion

A4.53 Entry barriers are important in the assessment of potential competition.[49] The lower entry barriers are, the more likely it is that potential competition will prevent undertakings already within a market from profitably sustaining prices above competitive levels.[50] The competitive constraint imposed by potential entrants is not simply about introducing a new product to the market. To be an effective competitive constraint, a new entrant must be able to attain a large enough scale to have a competitive impact on undertakings already in the market. This may entail entry on a small scale, followed by growth. Accordingly, whether there are barriers to expansion is also relevant to an SMP assessment. Many of the factors that may make entry harder might also make it harder for undertakings that have recently entered the market to expand their market shares and hence their competitive impact.

A4.54 A related factor is the growth in demand in the market. In general, telecoms providers are more willing to invest in a growing market (and less willing in a declining market). As a result, barriers to entry and expansion tend to be less of an impediment to competition in rapidly growing markets.

Countervailing buyer power

A4.55 A concentrated market need not lead to harmful outcomes if buyers have sufficient countervailing buyer power to curtail the exercise of market power. In general, purchasers may have a degree of buyer power where they purchase large volumes and can make a credible threat to switch supplier or to meet their requirements through self-supply to a significant degree. It is important to note, however, that the volumes involved must be large enough to make a material difference to the profitability of the current supplier. That is, an individual wholesale customer must represent a significant proportion of the total volume supplied by the relevant telecoms provider.

External constraints

A4.56 The SMP assessment should take account of all relevant competitive constraints, whether from inside or outside the relevant market as defined.[51] External constraints arise from products outside the relevant market which some customers might regard as substitutes to products which are in the market. External constraints by their nature tend to be relatively weak, but they can, when taken together and in combination with competition within the market, constrain a firm's ability to exercise market power.

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[49] EC SMP Guidelines, paragraph 60.
[50] However, the EC SMP Guidelines also note that "high barriers to entry may become less relevant in markets characterised by ongoing technological progress, in particular, due to the emergence of new technologies permitting new entrants to provide qualitatively different services that can challenge the SMP operator". EC SMP Guidelines, paragraph 60.
[51] EC SMP Guidelines, paragraph 64.

A5. Analysis of demand for broadband services since the 2014 WBA Market Review

Introduction

A5.1 This annex sets out further analysis of the demand for broadband services and supports our analysis and conclusions in Section 3 of this statement. This annex builds on similar analysis that we undertook in Annex 5 of our March 2018 WLA statement.[52]

A5.2 Much of that analysis is relevant to our review of WBA since the retail packages offering broadband are the same. The main difference is the context of the analysis, in that the WBA analysis takes as given the competitive effect from providers' offerings using regulated WLA inputs. Therefore, in the context of analysing the WBA market absent regulation (i.e. the modified greenfield approach described in Section 3 and Annex 4), the retail prices (and consumer behaviour) we actually observe are closer to what we might expect absent regulation of WBA – all the more so since little of the geographic market is now regulated (i.e. what was identified as Market A in the 2014 WBA statement and was then estimated to account for 9.5% of UK premises). The retail price and consumer behaviour examined in this annex is based on national-level data and updates, where appropriate, the assumptions made in the March 2018 WLA statement.

A5.3 This analysis examines the strength of constraints between:

- Broadband services of different speeds delivered over fixed access connections; and
- Broadband services delivered over fixed-access connections and broadband services delivered over alternative access connections (most notably wireless-based technologies).

Analysis of demand for broadband services in the WLA review

A5.4 Because of the nature of wholesale local access, the definition of the focal product in our March 2018 WLA statement centred on the underlying connection to premises and recognised the multiplicity of services (typically involving packages offering some form of internet access) over that connection. However, for completeness and by way of addressing representations received from stakeholders on the substitutability of broadband at different speeds, we investigated whether starting with a more narrowly-defined focal product could result in the identification of narrower product markets.

A5.5 In Annex 5 of our March 2018 WLA statement, we analysed demand for retail broadband services and considered how it might develop over the market review period (to 2020/2021). Our analysis assessed a range of evidence with a bearing on the degree of

[52] Ofcom, 2018. *Wholesale Local Access Market Review – Statement Volume 1*, Annex 5 https://www.ofcom.org.uk/__data/assets/pdf_file/0020/112475/wla-statement-vol-1.pdf.

substitutability between different broadband speeds, including retail price differentials, usage trends and their implications for demand (including bandwidth forecasts and consumer research), and evidence on propensity to downgrade.[53] Since the same retail services sit downstream of both the WLA and WBA markets, this analysis also informs our assessment of WBA product market definition and we summarise it, and our findings based on our analysis, below.

A5.6 We also undertook a critical loss analysis (CLA) to assess the potential profitability of an increase in the price of a given broadband speed. The hypothetical monopolist's "critical loss" threshold is the volume of lost sales at which its profits would be unaffected by a small but significant non-transitory increase in price (SSNIP) because the effect of lower sales would exactly offset the effect of higher margins on all remaining sales. If the projected loss in sales is lower than this threshold, this suggests that a SSNIP would be profitable. On the other hand, if projected losses exceed the threshold, the SSNIP will be unprofitable and the focal product set is expanded to include the nearest substitute(s).

A5.7 We have not always conducted critical loss analysis in previous market reviews. An analysis of this nature requires reliable information on gross margins and likely demand responses, which are not always available, and the results are often sensitive to the specific assumptions used to estimate these parameters. However, consistent with the relevant guidelines and the 2017 BCMR judgment, it may be appropriate to carry out a critical loss analysis where sufficient, and sufficiently reliable, data are available.[54]

A5.8 For the purposes of the CLA, we used estimates of responses to price increases (projected losses) derived from consumer research into residential customers' broadband demand (our summer 2017 consumer survey).[55]

A5.9 As usual with surveys of this kind, the hypothetical nature of the questions means that care should always be taken when interpreting the results and no single piece of evidence should be thought of as definitive on its own. We therefore considered evidence from the CLA alongside the other sources of evidence set out above to inform our view on the likely strength of substitutability between different broadband speeds.

A5.10 Overall, the analysis in our WLA review found that:

- Retail packages offering SFBB are likely to constrain the pricing of packages offering SBB;

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[53] March 2018 WLA statement, Annex 5, paragraphs A5.64 – A5.131.

[54] As explained in the OFT Guidance (paragraph 3.7), critical loss analysis is one of a number of tools for defining markets: "Evidence on substitution from a number of different sources may be considered. Although the information used will vary from case to case and will be considered in the round … in some cases critical loss analysis may be relevant". As set out in the recent 2017 BCMR judgment (*British Telecommunications plc v Office of Communications* [2017] CAT 25), however, there is no obligation or necessity in every case to conduct a critical loss analysis in order to conduct the HMT and define the relevant market, and in some cases it may not be useful to do so – this will depend on "the availability and reliability of the underlying data and the soundness of any assumptions underpinning the analysis". See paragraphs 165-166 of that judgment, http://www.catribunal.org.uk/files/1260_BT_Judgment_CAT_25B_101117.pdf.

[55] Full results of our summer 2017 consumer survey are published on our website at https://www.ofcom.org.uk/__data/assets/pdf_file/0017/112463/wla-statement-data-tables.pdf.

- Retail packages offering SBB are likely to constrain the pricing of packages offering SFBB, although this constraint is weaker than the constraint of SFBB on SBB;
- Retail packages offering faster SFBB services are likely to be constrained by switching to retail packages offering basic SFBB speeds; and
- Retail packages offering wireless access services are unlikely to constrain fixed (copper/fibre/cable) access service prices.

A5.11 We concluded that, "*Taking the range of evidence and analysis in the round, if we were to define a product market based on broadband speeds, rather than one based on local access connections, our judgement is that the evidence today points to a single market for SBB and SFBB*";[56] and that "*the product market would be no wider than fixed line broadband (i.e. over copper/fibre or cable connections)*".[57]

Application of the WLA analysis to our WBA market review

A5.12 The range of evidence considered in our March 2018 WLA statement focused on consumer behaviour over the last review period. We summarise that analysis below and it has informed our WBA product market definition assessment in reaching our findings at paragraphs A5.68 to A5.86 below.

A5.13 Because WLA and WBA are at different levels in the supply chain, their costs of provision, prices and gross margins differ. We have therefore adapted the critical loss analysis for WBA, using data from the 2018 WLA statement where applicable. Our methodology, indicating differences from the analysis presented in the 2018 WLA statement, is set out at paragraphs A5.14 to A5.67 below.

Analysis of switching in response to relative price changes

A5.14 As explained in Section 3, wholesale demand (for both WBA and WLA) is derived from retail demand and the primary source of constraints on a wholesale-level SSNIP is retail-level switching.

A5.15 Our analysis of switching behaviour in response to a SSNIP also used data relating to the retail level, including the projected rates of switching based on our consumer survey, and our assumptions about retail costs[58] and retail revenues. This data is also relevant to our analysis of the WBA market.

A5.16 However, there are differences at the wholesale level since, for the purposes of WBA product market definition, the relevant question is whether a hypothetical monopolist of wholesale broadband access services delivered over local access connections, rather than of the connections themselves, could profitably impose a SSNIP. At the wholesale level we

[56] March 2018 WLA statement, paragraph A5.135.
[57] March 2018 WLA statement, paragraph A5.136.
[58] Some costs which we have classified as retail costs (or downstream costs) in the WLA market fall into wholesale (upstream) costs when considering the WBA market. We have set out our treatment of different costs later in this section.

therefore assume, for the purposes of this review, that the upstream monopolist supplies WBA rather than WLA.

A5.17 In our WLA analysis, we considered two different types of hypothetical monopolist. The first is a hypothetical monopolist that supplies WLA to third parties at the wholesale level and does not itself supply downstream wholesale or retail customers (an "upstream monopolist"). However, absent regulation of WLA or WBA provided over that connection, competition would be confined to vertically integrated networks. As such, we also conducted the CLA from the perspective of a fully vertically integrated monopolist with a monopoly at the retail level.

A5.18 Applying the same approach for the WBA market, we would first consider an upstream monopolist of WBA services. The most realistic assumption for these purposes is that the WBA monopolist also controls all the upstream inputs needed to supply WBA services.

A5.19 We believe this that this assumption is the most appropriate for the following reasons:

- Firstly, a hypothetical monopolist of WBA which is not also the hypothetical monopolist of WLA would always face the threat of entry by a supplier of WLA.
- Secondly, BT, the operator previously found to have SMP in the WBA market review, is vertically integrated, and it is appropriate for us to reflect this in the assumptions of our analysis.

A5.20 We therefore consider two types of hypothetical monopolist:

- an upstream monopolist, who faces the costs of the WLA inputs and any required WBA inputs, and sells WBA services; and
- a vertically integrated monopolist, who faces the costs of the WLA and intermediate wholesale inputs and sells retail services to end consumers.

A5.21 We set out below how we estimate the critical loss thresholds and explain any differences from the corresponding thresholds calculated for the March 2018 WLA statement.

Estimation of the critical loss threshold

A5.22 The critical loss threshold is determined by a hypothetical monopolist's gross margin on the foregone sales that result from a SSNIP; the higher this margin, the bigger the profit impact resulting from a given loss of sales. In simple terms, the gross margin (M) is the difference between the price of a service (P), and the avoidable costs from not supplying that service (C), as a proportion of prices: M = (P – C) / P. Critical loss is then calculated as L = S / (S + M), where S is the hypothetical price increase and M is the gross margin (both expressed as a percentage).

Gross margin

Relevant time period and size of price increase

A5.23 As in our WLA analysis, we have assessed substitution and profitability over a one-year to two-year time period as this is consistent with relevant guidelines, the 2017 BCMR judgment and typical broadband contract terms.

A5.24 For the upstream monopolist, we have assessed the profitability of a 10% SSNIP by using projected demand responses to a 7.5% increase in retail prices. This is because, even assuming a full pass-through of the 10% wholesale price increase, this will not correspond to a 10% increase in retail prices, since the retail price will also include cost elements other than the wholesale inputs.[59] As we did not specifically ask respondents about their demand response to a 7.5% retail price increase, we project the demand response by taking an average of demand responses to a 5% and 10% retail price increase.

A5.25 In recognition of the fact that a hypothetical monopolist might have regard to the longer-term profitability impact of a SSNIP, we have also considered the implications for likely profitability of assuming a longer time horizon.

Scope and nature of the services

A5.26 We assume that the hypothetical monopolist of WBA supplies a product similar to BT's WBC, which is sold in both copper (SBB) and fibre (SFBB) variants. At the upstream level, we assume that the WLA wholesale inputs for providing SBB are WLR and SMPF, and that the inputs for providing SFBB are WLR and GEA-FTTC.

A5.27 Several different bandwidths of SFBB services are available. As we did for the purposes of the WLA statement, we have calculated a weighted average SFBB margin based on 2017/18 rental volumes for GEA-FTTC bandwidth variants (40/10, 55/10 and 80/20 lines).[60]

Wholesale prices

A5.28 For our upstream monopolist, we need to consider the unit revenues from selling WBC services (alongside WLR services) that would be forgone as volume declines in the event of a SSNIP.

A5.29 As in our WLA analysis, we have used Openreach's list price for WLR of £7.23 per month.[61] In addition to WLR, there are typically two ongoing revenue elements paid by WBA

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[59] We explained in the March 2018 WLA statement that a dilution ratio of around 50% was a reasonable approximation in the circumstances of the WLA market (paragraph 20 of Annex 5). In the WBA market, wholesale charges are inevitably a higher proportion of the retail price than charges for (upstream) WLA, specifically [✂]% points [25-35% points] higher for SBB and [✂]% points [25-35% points] higher for SFBB. We therefore find a dilution rate of around 75% for the wholesale SSNIP to be a reasonable approximation for WBA.

[60] We do not have bandwidth specific volumes for WBC products. As a proxy we use volume information for GEA FTTC products to weight the average SFBB margin. We have also combined 40/2 lines with 40/10 lines for the purpose of weighting GEA volumes because of significant migration away from 40/2 in 2017/18.

[61] We have used the WLR price that applied from 1 April 2016 to 30 June 2018. This is for consistency with our other price information and the time periods from which they were taken, e.g. our averaged retail prices are calculated with price information from July 2017 to September 2017. Nevertheless, even if we were to use the most recent WLR price, it would have no effect on our critical loss thresholds when reported to the nearest whole number. Source of WLR price information: https://www.openreach.co.uk/orpg/home/products/pricing/loadProductPriceDetails.do?data=%2BrBpMW3XM9acnyJyysVXlUueE80IBTlV7sFIBygiOy9UNeIS4WkJBRh6z%2FRUAlt8maxtgrEro1A7w5V8nzAZpQ%3D%3D.

customers. These are an end user access rental charge, and a bandwidth charge that is paid per Mbit/s.

A5.30 For the end user access rental charge, we take BT's monthly list prices[62] for WBC ADSL2+ £5.88 and WBC FTTC £14 for 40/10, £15 for 55/10 and £16 for 80/20.[63] Despite the fact that IPStream has historically been the charge controlled product in Market A, we think WBC ADSL2+ is the most appropriate copper-product to consider here because:

- IPStream is a legacy technology that is being phased out in exchanges where BT is rolling out WBC;
- BT aims to convert all existing IPStream connections to WBC connections by the end of the review period; and
- WBC is by far the more commonly used service, with over 4 million lines nationally compared to [✂] less than half a million IPStream lines.[64]

A5.31 BT's list price for bandwidth charges in Market A is £40 per Mbit/s. However, in practice, BT discounts [✂] from this price in Market B. We calculate that, in Market B, the average charge for WBC copper bandwidth is £[✂] per Mbit/s per month and the average charge for WBC fibre bandwidth is £[✂] per Mbit/s per month.[65] To calculate the average price that BT charges for bandwidth per customer, we have also calculated the average bandwidth consumed per end user and multiplied the resulting figure by the average actual charge per Mbit/s (including the applicable discount).

A5.32 Given the higher average bandwidth requirements for SFBB customers relative to SBB customers, we find that BT receives higher revenues from bandwidth charges for WBC fibre customers compared with WBC copper customers. We have therefore used revenues of £[✂] per customer per month for copper-based WBC services and £[✂] per customer per month for fibre-based WBC services.

Retail prices

A5.33 We have estimated average monthly revenues for dual-play packages of SBB and SFBB, taking account of introductory discounts, across a five-year customer lifetime.[66] We have

[62] We have also received information from BT that allows us to calculate average revenue per user for the end user rental price. This price reflects any discounts offered on the list prices. In the interest of disclosing more information, we have used list prices here. However, we have considered the impact on our critical loss thresholds of using lower prices (specifically prices at FAC below). BT's WBC average revenue for end user access rental is close to the level of FAC for these services.

[63] Prices weighted in the same way as for the GEA-FTTC margin above. Prices taken from BT Wholesale WBC Price List. https://www.btwholesale.com/assets/documents/Service_Provider_Price_List/WBC_Price_List_Entry_1June18_v3.xlsx

[64] BT response dated 9 January 2018 to Q2.1 of the 3rd WBA s135 dated 21 December 2017.

[65] We use BT's internal price for bandwidth charges in Market B because this is likely to be a reasonable proxy for the competitive price level. Prices taken from information derived from the 2016/17 RFS Additional Financial Information, flat file schedule, supplied in confidence by BT, dated 3 November 2017, and information from the 2016/17 RFS Additional Financial Information, schedule AFI A12 (Revenue analysis), supplied in confidence by BT, dated 3 November 2017.

[66] This is the representative average standard broadband customer lifetime for operators that purchase VULA from BT, that we used in our approach to calculating the VULA margin. See Ofcom, March 2015. *VULA Margin Statement*, paragraph 6.466. https://www.ofcom.org.uk/__data/assets/pdf_file/0015/72420/vula_margin_final_statement.pdf. We note BT's average customer lifetime is longer than 5 years. However, average monthly revenue is very similar whether assessed over five years or much longer horizons, so assuming a longer customer lifetime would not affect the results.

done so using Pure Pricing data for the three-month time period between July 2017 and September 2017,[67] as this overlaps with the date of our summer 2017 consumer research (from which we derive the projected loss of sales). We also exclude VAT, as this does not form part of the hypothetical monopolist's gross margin.

A5.34 For SFBB, we have estimated revenues for retail packages offering 38 Mbit/s, 50-52 Mbit/s, and 76 Mbit/s (and higher) speeds respectively, consistent with the wholesale products assumed to be supplied by the upstream hypothetical monopolist, as described in paragraph A5.26 to A5.27.

Wholesale costs

A5.35 Wholesale costs are relevant for assessing SSNIPs for both the upstream and vertically integrated monopolists. Specifically, we are interested in the wholesale costs that would be avoided for the volume reduction and time period relevant to assessing the profitability of a 5-10% price increase. As a proxy for the costs of a hypothetical monopolist we have used cost information for the largest provider in the wholesale (and retail) provision of broadband services over a fixed access connection, BT.

A5.36 In our WLA analysis, we used information from BT to calculate the long-run incremental cost (LRIC) of the relevant wholesale services. However, the LRIC of these services is likely to overstate the costs per line that are truly avoidable. First, some LRIC components are likely to be fixed and sunk, even in the medium-term (for example, the cost of digging duct and installing copper or fibre is sunk, and even assets that can be re-purposed – such as accommodation – would require time and additional cost to do so). Second, the LRIC of a given service will contain some costs that are only incremental at the service level (i.e. they are incurred as long as there are some volumes for the service increment, so are invariant to a less than full reduction in volumes for this service).

A5.37 It is difficult to identify exactly which components of the LRIC of each service the hypothetical monopolist would be able to avoid, following a loss in sales. Most avoidable costs are likely to relate to the operating costs associated with the maintenance and repair of lines, e.g. the pay-related components of BT's LRICs of these services, although some pay-related costs (such as General Management overheads) may be fixed with respect to small volume changes, particularly if the time horizon is short. On the other hand, focusing exclusively on pay-related costs might exclude some non-pay opex which would be saved.

A5.38 In the March 2018 WLA statement, we estimated a range for the avoided WLA costs, as follows:

- No avoided wholesale costs i.e. all costs are fixed with respect to the likely volume reduction from a SSNIP. This is more consistent with a shorter time horizon and smaller volume reductions but will likely understate avoided costs for longer time horizons.

[67] This captures all broadband offers available online from the following telecoms providers: BT, EE, Plusnet, Sky, TalkTalk, Virgin Media, and Vodafone.

- Pay-related components of BT's 2017/18 LRICs of these services, as well as other opex included within the modelled LRIC (which we referred to as "pay and other opex"). In practice, this captures all incremental operating costs other than accommodation, business rates and depreciation. We consider that "pay and other opex" are more likely to be avoidable costs for a given volume reduction, in the short to medium term, but they may still include some element of non-avoidable costs;
- The full service LRIC for 2017/18 i.e. a reduction in volumes allows the hypothetical monopolist to avoid the full LRIC of the service, averaged over all lines on the network. For the reasons set out above, this is likely to overstate the true avoided costs following any reasonable estimate of the volume reduction following a SSNIP over the time horizon relevant for evaluating the profitability of such a price increase.

A5.39 We have considered whether an upstream monopolist would be likely to face additional costs in the provision of WBA services, compared to the costs of providing WLA and whether these costs are likely to be avoidable. To do this, we have reviewed BT's financial information and assessed the components that are used to provide WBC.

A5.40 An upstream monopolist of WBA (in contrast to an upstream monopolist of WLA) would face costs associated with backhaul provided over the core network.

A5.41 In our "pay and other opex" and our "full service LRIC" scenarios, for both the upstream and vertically integrated monopolists, we have not excluded these backhaul and core network costs (i.e. they are treated as avoidable costs) in the tables below. This is for consistency with the treatment of these costs in the WLA statement Annex 5, where they formed part of the downstream costs of the hypothetical monopolist of WLA. To the extent that these costs are fixed in the short to medium term, this would lead us to overstate the critical loss thresholds, so our approach here is conservative (in that the critical loss is higher and therefore a finding that the candidate market should be broadened is more robust).[68] For the low cost scenarios (i.e. the "No avoided wholesale costs" and "Downstream costs only" scenarios, in which network costs are treated as unavoidable), these backhaul and core network costs are excluded.

Downstream costs

A5.42 Downstream costs are relevant for assessing a vertically integrated monopolist SSNIP. We have estimated average monthly downstream costs for SBB and SFBB using information obtained from BT on its ongoing downstream costs of supplying SFBB.[69] These costs are based on a LRIC+ standard and so include a contribution to fixed and common costs that would not be avoided if a portion of SFBB lines was lost. We have excluded the following items from the retail cost stack on the basis that these costs are likely to be fixed and sunk

[68] On the one hand, there are unlikely to be significant cash savings from reducing the total capacity of the core network once it has been provisioned. On the other hand, volume losses from a SSNIP might allow the hypothetical monopolist to avoid investment in capacity expansion in the near future – which seems plausible against a background of significant growth in fixed broadband traffic per line.

[69] This is provided by BT as part of its compliance with the *ex ante* VULA Margin condition. We have used data from July 2017 to September 2017, which overlaps with the period used to estimate retail revenues and the projected volume loss.

in the short to medium term: Customer Services – Overheads; Development costs; Marketing – Non-Campaign; other SG&A (Sales, General and Administration).

A5.43 We assume that the downstream costs incurred in the supply of SBB will be broadly similar to SFBB.

Gross margin estimates

A5.44 Table A5.1 presents gross margins, and equivalent critical loss thresholds, for a 10% SSNIP over SBB and SFBB. We present results separately for a hypothetical upstream monopolist and a vertically integrated monopolist. The critical loss thresholds are fairly low because the hypothetical monopolist's gross margins are fairly high, which is to be expected in an industry with high fixed and sunk costs.

Table A5.1: Gross margin and critical loss assumptions for a 10% SSNIP

Relevant margin	Avoided cost assumptions	SBB	SFBB
Upstream monopolist	**No avoided wholesale costs**		
	(Gross margin)	100%	100%
	(Critical loss threshold)	9%	9%
	Pay and other opex		
	(Gross margin)	70%-90% [✂]%	70%-90% [✂]%
	(Critical loss threshold)	10%-13% [✂]%	10%-13% [✂]%
	Full service upstream LRIC[70]		
	(Gross margin)	30%-50% [✂]%	30%-50% [✂]%
	(Critical loss threshold)	17%-25% [✂]%	17%-25% [✂]%
	Downstream costs only[71]		

[70] The critical loss is lower for SBB and SFBB compared to WLA reflecting higher margins for WBA services in this scenario.
[71] The critical loss is lower compared to WLA for both SBB and SFBB. This is because, in this scenario, we treat core network costs as a fixed upstream wholesale cost. In the WLA analysis, these costs were treated as a downstream cost and assumed to be avoidable in all cases (March 2018 WLA statement, paragraph A5.35).

	(Gross margin)	55%-95% [✂]%	55%-95% [✂]%
	(Critical loss threshold)	10%-14% [✂]%	10%-14% [✂]%
Vertically integrated monopolist	**Pay and other opex & downstream costs**		
	(Gross margin)	60%-90% [✂]%	60%-90% [✂]%
	(Critical loss threshold)	10%-14% [✂]%	10%-14% [✂]%
	Full service LRIC & downstream costs[72]		
	(Gross margin)	30%-60% [✂]%	30%-60% [✂]%
	(Critical loss threshold)	14%-25% [✂]%	14%-25% [✂]%

Estimation of projected loss in response to a SSNIP

A5.45 In our WLA analysis, we projected volumes of lost sales in response to a SSNIP using the results of our summer 2017 consumer research.[73] We set out our methodology in detail in paragraphs A5.38 to A5.41 of our WLA statement. In particular, we note that in calculating our critical loss figures:

- We have only included respondents who were certain or very likely to take action (i.e. we have assumed anyone who said they were "fairly likely" to switch away from the focal product, or who didn't know how likely they would be to switch away, would not actually do so). This is because responses may be subject to inertia bias, which refers to a tendency for survey respondents to overstate their likelihood to take action.
- For SBB respondents, we have also calculated a projected loss rate which rebases the sample to remove respondents who previously stated that they are certain or very likely to upgrade their broadband service to SFBB in the next 12 months, absent a price increase. This is because, on a forward-looking basis, these consumers are

[72] The critical loss is unchanged compared to WLA because the assumptions are identical to WLA in this scenario.
[73] This was published alongside the March 2018 WLA Statement https://www.ofcom.org.uk/consultations-and-statements/category-1/wholesale-local-access-market-review.

unlikely to fall within a focal product of SBB later into the market review period (i.e. beyond the first year).

A5.46 Below are the results for both a hypothetical monopolist and a vertically integrated monopolist:

Table A5.2: Critical loss assumptions and projected losses for a 10% SSNIP over SBB

Relevant margin	Avoided cost assumptions	Critical loss threshold	Projected loss[74]	
			All SBB respondents	Removing planned upgrades to SFBB
Upstream monopolist	No avoided wholesale costs	9%	30%	23%
	Pay and other opex	10%-13% [✂]%		
	Full service upstream LRIC	17%-25% [✂]%		
Vertically integrated monopolist	Downstream costs only	10%-14% [✂]%	34%	29%
	Pay and other opex & downstream costs	10%-14% [✂]%		
	Full service LRIC & downstream costs	14%-25% [✂]%		

Table A5.3: Critical loss assumptions and projected losses for a 10% SSNIP over SFBB

Relevant margin	Avoided cost assumptions	Critical loss threshold	Projected loss
Upstream monopolist	No avoided wholesale costs	9%	10%

[74] The projected loss for an upstream monopolist is higher in WBA compared to WLA. As explained in A5.24, in WBA the projected loss for an upstream monopolist is based on a 7.5% retail price increase, while in WLA it is based on a 5% retail price increase.

Relevant margin	Avoided cost assumptions	Critical loss threshold	Projected loss
Vertically integrated monopolist	Pay and other opex	10%-13% [✂]%	11%
	Full service upstream LRIC	17%-25% [✂]%	
	Downstream costs only	10%-14% [✂]%	
	Pay and other opex & downstream costs	10%-14% [✂]%	
	Full service LRIC & downstream costs	14%-25% [✂]%	

Interpretation of critical loss analysis for broadband services of different speeds

A5.47 The results presented in Figure A5.2 indicate that a hypothetical monopolist is unlikely to be able to profitably impose a SSNIP over SBB. The level of switching away from SBB exceeds the threshold necessary to make this price increase unprofitable under most [✂] scenarios, and by a significant margin. [✂].

A5.48 As was the case for a hypothetical monopolist of WLA, the projected loss estimates for SFBB in Figure A5.3 lie within our ranges for the critical loss thresholds. We have therefore given closer examination to the following assumptions.

Avoided cost assumptions

A5.49 We have explained that a hypothetical monopolist in this context could be assessing profitability over a one to two-year time horizon, but possibly longer (e.g. average customer lifetimes, which are in the region of 5 years). We have also explained that the full service LRIC is likely to overstate avoided costs for the volume reductions indicated by our consumer research, particularly for a one to two-year time horizon, and that pay and other opex are likely to represent a more plausible estimate of avoidable wholesale costs (and we note the conservative treatment of backhaul and core network costs treated as fully

avoidable in this scenario as well). Figure A5.3 shows that the critical loss thresholds associated with this scenario are [✂].[75]

The effect of planned upgrades

A5.50 The results presented in Figure A5.3 above focus on the profitability related to *existing* SFBB customers. In reality, a hypothetical monopolist of SFBB will experience a significant expansion in volumes in the near future, in the form of expected upgrades from SBB to SFBB. To the extent that some of these future customers are deterred from upgrading to SFBB by the price increase, this would have a further negative profit impact.

A5.51 Our survey cannot tell us exactly what proportion of SBB respondents, if any, would be deterred from upgrading. However, 19% of SBB respondents said they were certain or very likely to switch to SFBB in the next 12 months.[76] We can therefore estimate what proportion of these planned upgrades would need to be deterred, to make a SSNIP unprofitable for any given estimate of avoided costs (where a SSNIP is currently profitable for that estimate of avoided costs). Based on relative subscriber volumes in the UK at the time of our survey, we estimate that, for example, [✂].

A5.52 This "breakeven" proportion of around [✂]. If these respondents displayed a similar propensity to cancel their migration to SFBB, following a SSNIP for SFBB,[77] the combined projected loss from existing and future SFBB subscribers would be [✂].[78] There would still be a shortfall in projected loss when compared with critical loss thresholds under the full LRIC scenario, but for reasons stated above, this cost scenario is likely to overstate the relevant avoided costs. Further, the hypothetical monopolist may face additional losses in future if SBB customers intending to migrate to SFBB beyond 12 months are deterred from doing so.

A5.53 While the precise magnitude of any impact is clearly uncertain, we consider that upgrades are likely to be price sensitive. For example, our summer 2017 consumer research found that price was an important reason behind respondents' decision not to upgrade to SFBB.[79] It also found that around 72% of all respondents planning to change broadband speed would bring forward this move, if the price of their current service increased. Furthermore, a recent survey of the available literature on the cross-price elasticity of SFBB demand with respect to SBB prices found estimates ranging from 0.66-0.96 (at the lower end) to 3.2 at the upper end, with another estimate within this range (1.2).[80] Although we are in this context considering an increase in SFBB rather than SBB prices, these estimates are

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[75] [✂].
[76] This is discussed in more detail in the March 2018 WLA statement Annex 5, paragraph A5.94.
[77] The demand response among the 19% of SBB respondents planning to upgrade is actually higher than this, because they are more price sensitive than other SBB subscribers, but we do not have a robust point estimate due to the low base size.
[78] The projected loss for an upstream monopolist is slightly higher in WBA compared to WLA. As explained in A5.24, in WBA the projected loss for an upstream monopolist is based on a 7.5% retail price increase, while in WLA it is based on a 5% retail price increase.
[79] March 2018 WLA statement, paragraph A5.96.
80 See C. Cambini, 2015, *Economics aspects of migration to fibre and potential welfare gains and losses from an uplift to copper prices* (Paper Prepared for the New Zealand Commerce Commission) https://www.comcom.govt.nz/dmsdocument/13127.

nevertheless consistent with a view that upgrading from SBB to SFBB is sensitive to relative prices, and therefore that an increase in SFBB prices relative to SBB could deter or delay future upgrades.

Use of current prices

A5.54 Current prices may not always be a good benchmark for the competitive price level, either at the wholesale or the retail level. This issue is of particular relevance to a SSNIP over SFBB, since WBC over fibre prices are not currently subject to cost-based charge controls and the cost-based charge controls on VULA imposed in the March 2018 WLA Statement had not been implemented at the time our price data was collected. This could affect the analysis in two ways: first, it can produce lower critical loss thresholds, by increasing gross margins, and second, it can produce higher projected loss rates if respondents consider more alternatives to be viable substitutes at this elevated price level. The consequence of both impacts is to make a profitable SSNIP less likely than if it is applied to a lower starting price level, meaning that the use of current prices may lead to identifying product markets which are too wide.

A5.55 We have explored the likely magnitude of the first impact by calculating the impact on critical loss thresholds if the price of all WBC over fibre services was equal to unit FAC,[81] taking into account the reduction in the GEA-FTTC charges expected over the review period.[82] We find that this [✂], we note the conservative treatment of backhaul and core network costs treated as fully avoidable in this scenario. Furthermore, [✂]. However, we again note the potential overstatement of avoided costs due to the inclusion of the backhaul and core network costs in full in our pay and other opex estimates. When we treat backhaul and network costs as fixed in our pay and other opex estimates, [✂]. However, the impact on projected loss rates is more difficult to gauge, though we note that demand responses in our survey did not vary significantly between 5% and 10% price increases.

Summary

A5.56 Based on the results of the summer 2017 consumer survey, it appears that the strength of constraints from demand-side switching between SBB and SFBB are asymmetric. Responses by SBB users to a SSNIP on SBB appear to be around two to three times those of SFBB users to a SSNIP on SFBB.

A5.57 Nevertheless, for a SSNIP on SFBB, the critical loss analysis suggests that for a reasonable time horizon for considering avoided costs, substitution and planned upgrades, a SSNIP is likely to be unprofitable. However, this is sensitive to the assumed level of avoided costs and starting charges. If avoided costs were significantly higher than our preferred

[81] The use of FAC means that charges will still be above the LRIC of these services and even further above our estimates of avoidable costs (such as pay and other opex).
[82] We reduce the FAC of all WBC fibre charges by £2.40 per month, the level of reduction in the 40/10 VULA charge over the WLA review period. We also assume full pass-through i.e. the vertically integrated monopolist lowers retail prices by the same amount.

assumptions (although avoided costs could also be lower, particularly given our conservative treatment of backhaul and core network costs), the impact on delayed or cancelled upgrades to SFBB might need to be very large for the projected loss to exceed the critical loss. If the competitive level of charges were assumed to be lower than current levels, this increases the likelihood of a SSNIP on SFBB being profitable (other things equal), with the result being most sensitive for one scenario [✂]. For the [✂].

Critical loss analysis for SFBB services of different speeds

A5.58 As in our March 2018 WLA Statement, we have tested whether the constraint from SBB and basic SFBB services is likely to provide an effective constraint on higher speed services, and whether there might be a break in the chain of substitution between broadband speeds here.

A5.59 In response to a 10% SSNIP on SFBB services at 50 Mbit/s and above, we find in Figure A5.4 that between 12% and 13% of respondents on faster SFBB speeds said that they would be certain or very likely to switch away from these services (before considering any impact on planned upgrades). [✂].

A5.60 This is consistent with evidence from [✂].[83]

A5.61 Overall, this implies that we would not further narrow the focal product used in the previous SSNIP tests (i.e. over all SFBB).

Figure A5.4: Critical loss and projected loss results for a 10% SSNIP over faster SFBB speeds

Relevant margin	Avoided cost assumptions	Critical loss threshold	Projected loss
Upstream monopolist	No avoided wholesale costs	9%	12%
	Pay and other opex	10%-13% [✂]%	
	Full service upstream LRIC	17%-25% [✂]%	
Vertically integrated monopolist	Downstream costs only	10%-14% [✂]%	13%
	Pay and other opex & downstream costs	10%-14% [✂]%	

[83] [✂].

Relevant margin	Avoided cost assumptions	Critical loss threshold	Projected loss
	Full service LRIC & downstream costs	14%-25% [✂]%	

All fixed broadband

A5.62 We have also used the critical loss framework to assess the degree of substitutability between broadband services delivered over fixed access connections and broadband services delivered over other forms of access connection.

A5.63 The gross margin associated with a SSNIP over all fixed broadband is a weighted average of gross margins for SBB and SFBB. As these margins are relatively similar (see Figure A5.1 above), the critical loss thresholds for a fixed broadband SSNIP would be similar to the thresholds for both SBB and SFBB.

A5.64 However, estimating the demand response to a fixed broadband SSNIP is more difficult, because we did not specifically ask respondents about their response to a SSNIP over all fixed broadband. Therefore, we have sought to infer a range for the likely response to a SSNIP over all fixed broadband services, based on two alternative assumptions:

- No reapportionment: All respondents who state that they would switch between SBB and SFBB in response to a SSNIP on either SBB or SFBB would remain on fixed broadband.
- Full reapportionment: Respondents who state that they would switch between SBB and SFBB in response to a SSNIP on either SBB or SFBB are reapportioned across all the other options (including "Don't Know").

A5.65 The results of a 10% SSNIP over all broadband packages delivered over fixed access lines are summarised in Figure A5.5.

Figure A5.5: Critical loss and projected loss results for a 10% SSNIP for all fixed broadband

Relevant margin	Avoided cost assumptions	Critical loss threshold	Projected loss	
			No reapportionment	Full reapportionment
Upstream monopolist	No avoided wholesale costs	9%		
	Pay and other opex	10%-13% [✂]%	7%	9%

Relevant margin	Avoided cost assumptions	Critical loss threshold	Projected loss	
			No reapportionment	Full reapportionment
Vertically integrated monopolist	Full service upstream LRIC	17%-25% [✂]%	7%	10%
	Downstream costs only	10%-14% [✂]%		
	Pay and other opex & downstream costs	10%-14% [✂]%		
	Full service LRIC & downstream costs	14%-25% [✂]%		

Figure A5.6: Breakdown of projected losses by alternatives to fixed broadband (Percentage of respondents certain or very likely to switch to alternative technologies)

		Mobile	Satellite	Give Up Internet	Other	Total[84]
No reapportionment	Upstream monopolist[85]	3%	1%	1%	1%	7%
	Vertically integrated monopolist	2%	1%	1%	2%	7%
Full reapportionment	Upstream monopolist[86]	4%	2%	2%	2%	9%

[84] Differences between the sum of the breakdown percentages and the total percentages are due to rounding.
[85] The projected loss for an upstream monopolist is higher in WBA compared to WLA. As explained in A5.24, in WBA the projected loss for an upstream monopolist is based on a 7.5% retail price increase, while in WLA it is based on a 5% retail price increase. However, since demand responses for a 5% SSNIP leading to switching to mobile were greater than the 10% SSNIP, the projected loss to mobile is lower for a WBA upstream monopolist.
[86] The projected loss for an upstream monopolist is higher in WBA compared to WLA. As explained in A5.24, in WBA the projected loss for an upstream monopolist is based on a 7.5% retail price increase, while in WLA it is based on a 5% retail price increase. However, since demand responses for a 5% SSNIP leading to switching to mobile were greater than the 10% SSNIP, the projected loss to mobile is lower for a WBA upstream monopolist.

		Mobile	Satellite	Give Up Internet	Other	Total[84]
	Vertically integrated monopolist	3%	2%	2%	3%	10%

A5.66 Figure A5.5 shows that the projected loss rates are lower than and, [✂], equal to the critical loss thresholds. The projected loss only equals the critical loss [✂] and also that those switching between SBB and SFBB in response to a SSNIP on either SBB or SFBB would give up fixed broadband for some other form of internet access, or even give up internet access entirely. Giving up internet access seems an implausible assumption for those that clearly have a high willingness to pay for broadband (i.e. existing SFBB customers). More generally, giving up fixed broadband would also typically involve giving up fixed line telephony and, for many consumers (i.e. those on triple-play tariffs), IPTV or cable-TV. In practice, therefore, such consumers would need to consider whether the prices for standalone TV or voice services were within their valuation of these as standalone (rather than bundled) services.

A5.67 The results indicate that a SSNIP over all fixed broadband is very likely to be profitable.

Price differentials

A5.68 Our analysis of price differentials was set out in detail in paragraphs A5.64-A5.76, and Figures A5.7 – A5.10 of the March 2018 WLA statement.

A5.69 Patterns in price changes for services potentially provide useful information on the substitutability of those services. For instance, two services showing the same pattern of price changes, for reasons not connected to costs or general price inflation, would be consistent with these services being close substitutes. Equally, price divergence over time, without significant levels of substitution, would be consistent with the two products being in separate markets.[87]

A5.70 To calculate price differentials, we have as far as possible followed the methodology that we used to calculate comparable monthly broadband prices in our 2014 WBA Statement.[88] This means that average prices include any promotional discounts. However, we have not included certain one-off charges (e.g. installation, kit and delivery) as this data was not available for the duration of our time period. We have also excluded any line rental saver payment options. Finally, we have used an average monthly price over the length of the minimum contract term of each package, rather than using a 24-month time horizon for all

[87] See paragraph 3.7 of the OFT's market definition guidelines.
[88] Ofcom, 2014. *Wholesale Broadband Access Market Review Final Statement,* paragraphs, A5.27-A5.33. https://www.ofcom.org.uk/__data/assets/pdf_file/0027/63675/statement_annexes.pdf.

packages. While these adjustments may affect the level of prices, we consider that they are unlikely to materially alter the pattern of relative SBB and SFBB prices.

A5.71 Our analysis of price differentials suggested that:

a) There is reasonable correlation between average SBB and SFBB retail prices.

b) While there was a differential between average retail prices, this is to be expected when considering differentiated products. The differential had been broadly stable, although it had fallen slightly over the preceding year.

c) The size of the retail price differential (at around £5 to £10 per month) was not that large relative to a 10% retail SSNIP (at around £2.50 for SBB packages and £3-4 for SFBB packages). Consumers may therefore be more likely to respond to a SSNIP by substituting from one product to another, than they would if the SSNIP was a small proportion of the differential between those products.

d) The price correlation for different SFBB speeds was consistent with substitutability. The retail price differential had also remained broadly flat, suggesting little change in the strength of such substitutability over the period.

e) While there are clearly price premia for faster speeds on average, there are nevertheless significant overlaps between different providers' retail prices (see Figure A5.10 of the March 2018 WLA statement and Figure 3.2 of this statement). Overlapping price bands indicate that headline download speed is not the only package characteristic that is valued by customers i.e. that, for a given price, customers are prepared to trade off lower speeds for other broadband package features, such as a higher data allowance, call usage, perceived quality of service, etc. It also suggests that some consumers have had the opportunity to upgrade their broadband speed at no extra price by switching packages. These factors make it more likely that an increase in the price of broadband services of a given speed would trigger a demand response at the retail level.

Usage trends and implications for demand

A5.72 Our analysis of usage trends and implications for demand was set out in detail in paragraphs A5.77-A5.118, Figures A5.11 – A5.12 and Table A5.13 of the March 2018 WLA statement.

A5.73 Evidence of migration between retail packages offering different broadband speeds can provide an indication of the relative substitutability of these services in response to a SSNIP, if accompanied by changes in relative prices. For example, if there was an increase in the price of SBB relative to SFBB, we might expect further uptake of SFBB (from existing SBB customers) in addition to those SBB customers who would have migrated to SFBB in any case (i.e. even if the differential had remained unchanged).

SBB and SFBB

A5.74 We considered evidence on data usage and household demand from our volume forecasts, our 2017 consumer market research and stakeholders' own market research that they had undertaken in relation to consumers' underlying broadband preferences.

A5.75 We consider that increasing data usage over time is likely to be reflected in higher bandwidth demand from retail broadband packages, meaning more households are likely to require SFBB speeds to accommodate their usage in future. However, our observations on usage trends and from consumer research suggest that there is a group of broadband consumers who appear unlikely to need more than SBB, but there is also a significant group of SBB who want, and are likely, to upgrade to SFBB at current prices. There is also likely to be another group who would upgrade if the price differential between SBB and SFBB were lower.

Different SFBB speeds

A5.76 We updated our forecast volumes of GEA rentals (i.e. wholesale access services used to supply SFBB that sit upstream from WBA), as set out in Figure A5.13 of the March 2018 WLA statement. These forecasts were developed for our WLA charge control modelling (see Annex 10 of Volume 2 of the March 2018 WLA statement), and use updated information from telecoms providers.

A5.77 These forecasts for external lines suggest that most GEA lines purchased by telecoms providers other than BT will continue to be for the 40/10 GEA service.

A5.78 We project that there will be continued high take-up of SFBB, with SFBB accounting for around 70% of broadband lines by the end of the review period. This reflects increasing household demand for bandwidth, and positive willingness to pay for faster speeds.

Propensity to downgrade

A5.79 Our analysis on consumer propensity to downgrade was set out in detail at paragraphs A5.119-A5.131 and Tables A5.14-A5.15 of the March 2018 WLA statement.

A5.80 If consumers consider that one broadband package is a substitute for a package with a faster broadband service, we would expect to find evidence of willingness to downgrade broadband speed as well as to upgrade. Limited evidence of downgrading speed would be consistent with a view that the strength of the constraint from SBB on SFBB is diminishing if the relative price of SFBB had increased over that period.

A5.81 We considered the results from our summer 2017 consumer research, as well as research undertaken by stakeholders. We also obtained data from stakeholders on within-provider migrations between SBB and SFBB as well as migrations between different SFBB speeds. (Information about inter-provider switches is more limited.)

A5.82 There has been limited downgrading from SFBB to SBB, which could be consistent with SBB being a weaker substitute for SFBB users (than is SFBB for SBB users), although this

evidence is against a backdrop of broadly flat SFBB prices and, if anything, a falling premium relative to SBB of late. If the premium for SFBB were instead to increase in future we could potentially see more downgrading from SFBB to SBB, but we cannot be certain of this.

Summary of implications

A5.83 In the March 2018 WLA Statement, we considered a range of evidence focused on consumer behaviour over the last review period. This evidence also informs our WBA product market analysis. We find that:

- Price differentials are consistent with there being a degree of substitutability between SBB and SFBB, such that the availability of SBB continues to constrain SFBB prices and vice versa, and between SFBB of different speeds.
- Usage trends and consumer research suggest that there is a group of broadband consumers who appear unlikely to need more than SBB, but there is also a significant group of SBB who want, and are likely, to upgrade to SFBB at current prices. There is also likely to be another group who would upgrade if the price differential between SBB and SFBB were lower.
- Higher bandwidths will become more important over the forthcoming review period, but we can still expect a large proportion of retail subscribers to take a 40/10 fibre service by 2020/21.
- There has also been limited downgrading from SFBB to SBB, which could be consistent with SBB being a weaker substitute for SFBB users (than is SFBB for SBB users), although this evidence is against a backdrop of broadly flat SFBB prices and, if anything, a falling premium relative to SBB of late.

A5.84 Our updated critical loss analysis also supports our earlier findings. It suggests that substitution from SBB to SFBB constrains the pricing of SBB. We also consider that substitution from SFBB to SBB is likely to constrain the pricing of SFBB. However, these constraints appear to be asymmetric in that demand-side substitution in response to a SSNIP on SBB would appear greater than that in response to a SSNIP on SFBB. Nevertheless, for a SSNIP on SFBB, the critical loss analysis suggests that for a reasonable time horizon for considering avoided costs, substitution and planned upgrades, a SSNIP is likely to be unprofitable. However, this is sensitive to the assumptions used, and in particular if avoided costs were significantly higher than our preferred assumptions, then a SSNIP on SFBB could be profitable, unless the impact on delayed or cancelled upgrades to SFBB were also very large. Similarly, an assumption of lower starting charges could affect the profitability of a SSNIP on SFBB under one of the scenarios modelled [✂].

A5.85 We also find that some consumers taking retail packages with faster SFBB speeds would switch away from these services to alternatives, including basic SFBB speeds, if the price of the former services increased. This is likely to be sufficient to constrain a SSNIP for a hypothetical monopolist of faster SFBB packages.

A5.86 In relation to the profitability of a SSNIP over all fixed line broadband packages, we consider that the evidence is consistent with substitution to other forms of internet access

being insufficient to constrain the profitability of SSNIP on fixed line broadband. This implies that the product market would be no wider than fixed line broadband (i.e. retail packages offering wireless access services are unlikely to constrain broadband packages over fixed access connections).

A6. Geographic analysis

A6.1 A key part of the process for our geographic market assessment is our analysis of data provided by telecoms providers regarding the geographic reach of their networks. This annex describes the approach and results of this geographical analysis.

A6.2 As described in Section 4, we use the BT local exchange as the relevant geographic unit in our assessment. At present, there are 5,572 local exchanges in BT's network.[89]

A6.3 The rest of this annex is structured as follows:

- a summary of the data sources (from telecoms providers and other sources) used to conduct our analysis and an overview of our model;
- analysis of BT exchanges;
- data on active circuits;
- grouping of exchanges and sensitivity analysis; and
- a map showing the geographic areas falling within Market A and Market B.

Data sources and model overview

A6.4 The inputs to our model come from the following sources:

Table A6.1: Inputs and source

	Source	Description	Reference
1	Ordnance Survey	Premises per postcode for Northern Ireland (NI).	Produced by Ofcom,[90] with reference to Ordnance Survey, AddressBase Premium Islands, Epoch 49, May 2017.
2	Ordnance Survey	Premises per postcode, for the UK excluding NI.	Produced by Ofcom, with reference to Ordnance Survey AddressBase Premium, Epoch 49, May 2017.
3	Ordnance Survey	Delivery Points (DPs) per postcode for UK and Northern Ireland (NI)	Ordnance Survey, CodePoint 2015.
4	Openreach	Correlation between BT Local Exchange Codes and Postcodes.	BT response to 3rd WBA s.135 Notice, Q1.2, dated 21 December 2017.
5	Openreach	Number of MPF/SMPF active circuits, per Openreach customer, per BT Local Exchange.	BT response to 38th WLA WBA s.135 Notice, Q1.7, dated 19 September 2017.

[89] As discussed in Section 4, we define the Hull Area (where KCOM is the predominant fixed network provider) as a separate geographical market. Accordingly, this Annex focuses on the UK excluding the Hull Area.
[90] We have used data consistent with that used to produce the Connected Nations report. This is covered in the subsection Exchange Size Calculation, below.

6	Openreach	Openreach customers' plans to roll-out LLU to BT Local Exchanges	BT response to s.135 Notice, Q1.8, dated 19 September 2017.
7	Virgin Media	Number of premises passed by Virgin Media's cable network.	Virgin Media response to WBA WLA s.135 Notice Q.1 dated 16 January 2018.
8	Virgin Media	Number of premises served by Virgin Media's cable network.	Virgin Media response to WBA WLA s.135 Notice Q.2 dated 16 January 2018.
9	BT Wholesale	IP Stream ADSL active circuits per BT Local Exchange and per BT Wholesale customer.	BT response to 3rd s.135 Notice, Q 2.1b dated 21 December 2017.
10	BT Wholesale	WBC ADSL active circuits per BT Local Exchange and per BT Wholesale customer.	BT response to 3rd s.135 Notice, Q. 2.1b, dated 21 December 2017.
11	Openreach	Invalid exchange codes used in BT's systems.	BT response to 3rd WBA request, Q.1.3, dated 21 December 2017.
12	Openreach	Number of premises reached by Openreach's fibre-enabled cabinets in each postcode.	BT response to 38th WLA s.135 Notice, Q1.2, dated 3 October 2017, updated 26 July 2018.
13	Openreach	Correlation between each fibre-enabled cabinet and serving Copper and Fibre Exchanges.	BT response to 38th s.135 Notice, Q1.1, dated 3 October 2017, updated 26 July 2018.
14	Openreach	Number of FTTC active circuits, per Openreach customer, per cabinet.	BT response to s.135 Notice, Q1.3, dated 19 September 2017.
15	Openreach	List of cabinets where Openreach has confirmed plans to rollout fibre and number of premises in each postcode.	BT response to s.135 Notice, Q1.5, dated 19 September 2017.
16	Openreach	Correlation between each cabinet where Openreach has confirmed plans to rollout fibre and corresponding Copper and Fibre Exchanges.	BT response to s.135 Notice, Q1.4, dated 19 September 2017.
17	Openreach	Test exchange codes, to be excluded from the analysis.	BT response to s.135 Notice, Q1.3, dated 21 December 2017.
18	Openreach	Invalid CP names in the data, used by BT for system testing only.	BT response to s.135 Notice, Q1.3b, dated 21 December 2017.
19	Openreach	MDF Codes of collocated BT exchanges	BT response to s.135 Notice, Q1.3a, dated 21 December 2017.
20	Openreach	List of BT's non-broadband-enabled exchanges.	BT response to s.135 Notice, Q1.1, dated 21 December 2017.

21	Openreach	For each relevant Local Exchange area and postcode within that area, number of premises passed by BT's FTTP + Copper networks and number of premises passed by BT's FTTP-only network, grouped by fibre headend exchange code.	BT response to s.135 Notice, Q2.1, dated 21 December 2017.

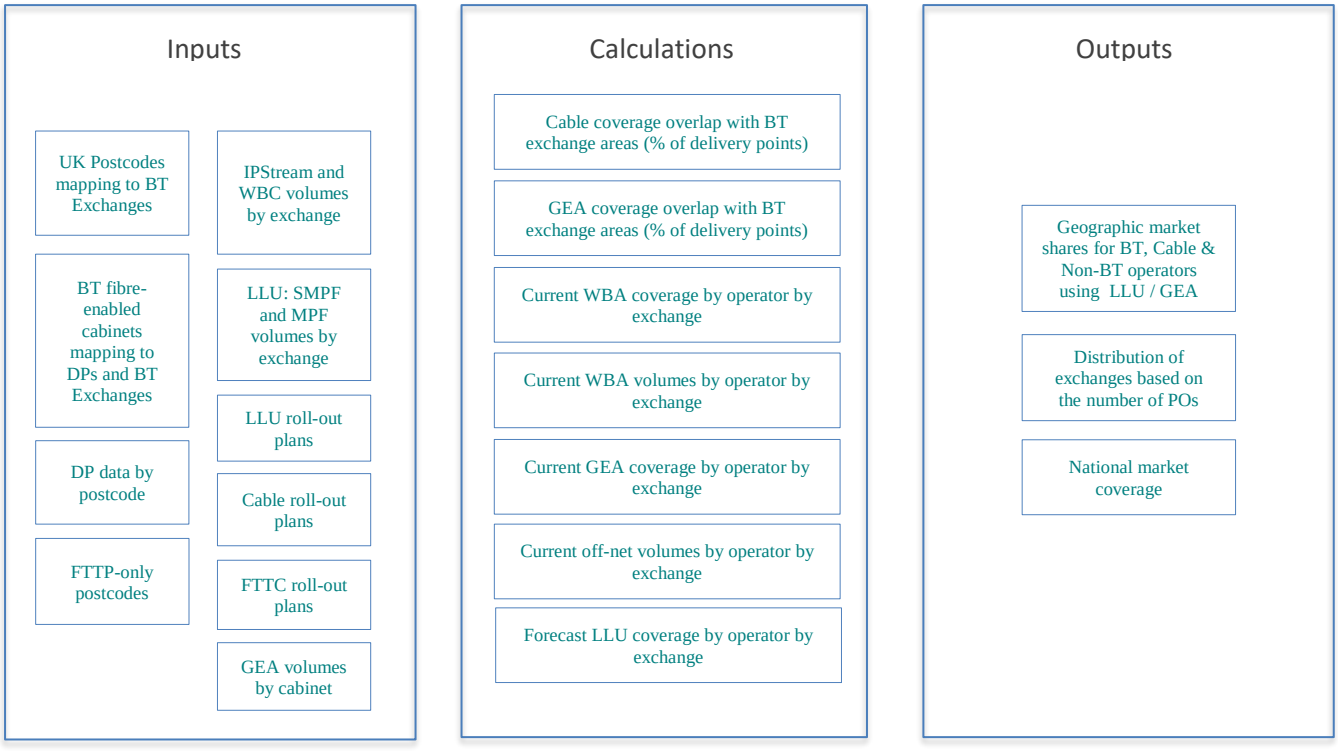
Source: Ofcom

Overview of the structure of the model

A6.5 Figure A6.2 shows an overview of the main steps (inputs, calculations and outputs) of the model we used to assess and define geographic markets.

A6.6 The model determines the number of exchanges with any given number of operators present and the wholesale market shares within each of those exchanges. It also determines the national coverage of each operator in terms of exchanges and premises. Throughout the model, we use the term Delivery Point (DP) to refer to a range of premises where broadband can be delivered, not just residential buildings.

Figure A6.2: Overview of the model



Source: Ofcom

Analysis of BT's exchanges

A6.7 We have examined the data from BT as provided in responses to information requests (as set out in Table A6.1 above) against that used in the 2014 WBA Statement.

A6.8 In the 2014 WBA Statement, we included 5,586 BT exchanges in our defined geographic markets (Market A, Market B) excluding the Hull Area. This included 26 exchanges, where BT informed us it did not provide copper-based broadband services and two pairs of collocated exchanges (Main Distribution Frame or MDF codes): CLWOO with CLFAR and CLFLE with CLMOO. As with our previous market review, areas served by a group of collocated exchanges (MDF codes) are associated with a single MDF code for our analysis as we consider that competitive conditions will be the same.

A6.9 Since then, BT has collocated more of its exchanges.[91] Specifically,

- CLWOO, CLFLE and CLMOO are now collocated with CLFAR,
- EACHU has been collocated with EAHLW,
- LNCNW and LNDZ2 have been collocated with LNPOP,
- SDGTWCK has been collocated with SDHRLY,
- STBUCKH has been collocated with STBEULI,
- SWRTH has been collocated with SWCFATE,
- WRBEL and WRSLO have been collocated with WRSKEN, and
- WRECT and WRWKEN have been collocated with WRFULM.

A6.10 In the consultation, CLHOL was considered as collocated with CLCOV. However, BT has now informed us that both exchanges remain operational, at their own buildings. Similarly, NSDIN with NSABO were planned to be collocated by BT, but the plan was aborted.[92]

A6.11 Furthermore, exchange THSL/UD has been renamed to THSL, LWXEK has been renamed to LWSKY, SWNE/CH has been renamed to SWNECH, SWMT/EX has been renamed to SWMTEX, and SWNE/EX has been renamed to SWNEEX.[93]

A6.12 The following local exchanges have been confirmed as not used: CMMMY, DUMMY, EAMMY, ESMMY, LNMMY, NSMMY, NEMMY, NIMMY, NO_DATA, SMMMY, SSMMY, STBBVS, STMMY, SWPLAYD, SWSKY, THMMY, WEMMY, WMMMY, WNMMY and WSMMY.[94]

A6.13 Also, since the 2017 WBA consultation, CMCVROM is no longer used.[95] STWHTLY is a new exchange since the last market review, where BT Wholesale provides IPstream and WBC services to several operators.

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[91] BT response dated 17 January 2018 to question 1.3a of the section 135 notice dated 21 December 2017.
BT follow up response dated 2 March 2018, Table 1a.
[92] Openreach follow up response dated 2 March 2018 to question 1.3a of the section 135 notice dated 21 December 2017.
[93] BT follow up response dated 2 March 2018, Table 1a, to question 1.3a of the section 135 notice dated 21 December 2017.
[94] BT follow up response dated 2 March 2018, Table 2a, to question of the section 135 notice dated 21 December 2017.
[95] Openreach follow-up response dated 2 March 2018, to Question 1.3 of section 135 notice dated 21 December 2017.

A6.14 These changes leave 5,572 exchanges.

A6.15 Finally, there are 26 local exchanges where BT has confirmed it does not provide broadband services. These are: EAPRI, NDISF, NSBAY, NSBNS, NSBRN, NSBVS, NSCRN, NSCWY, NSDRN, NSERI, NSGRE, NSGRO, NSLEV, NSLMD, NSLPT, NSMAN, NSNBY, NSNTT, NSSCP, NSSOL, NSSPY, NSSST, NSTIM, SDPLSTW, SDSTMRD, SDSTTN.[96]

Exchange size calculation in the 2017 WBA Consultation

A6.16 In the last market review, we used Ordnance Survey CodePoint data, to estimate the number of delivery points (DPs) in each UK postcode. This information was combined with BT's data, on postcodes served by each local exchange, to estimate the total number of DPs in each local exchange.

A6.17 Prior to the 2017 WBA consultation, BT informed us that its estimated DPs for fibre coverage had been derived from a different dataset, the OS MasterMap® Address Layer 2 dataset.[97] Compared to CodePoint, Address Layer 2 contained additional information on premises with multiple dwellings. For premises that would be reported as a single DP in CodePoint,[98] Address Layer 2 would take into account all the apartments/flats. Hence, to calculate fibre coverage correctly, our analysis had to be adjusted accordingly.

A6.18 At the time we received BT's data,[99] Address Layer 2 had been withdrawn by Ordnance Survey and we could not license it.[100] Ordnance Survey's AddressBase Plus provided the most recent and most accurate information on UK properties that we could use for the consultation.[101] To ensure that our estimated number of DPs, in each postcode, did not contain properties that were not eligible for broadband, we identified the categories of properties to be removed.

A6.19 We explained our approach and how we processed the data in our 2017 WBA consultation.[102] We identified 31,097,588 DPs,[103] which was 8.62% higher than the DPs identified in the last market review (28,627,237) and we noticed that the new dataset exhibited a higher number of postcodes that could not be matched to BT's Exchange Areas.[104]

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[96] Openreach response dated 17 January 2018 to question 1.3c of the section 135 notice dated 21 December 2017.
[97] BT's responses from 17 March 2016, 31 March 2016 to Ofcom's 1st WBA & WLA s135 Request, dated 8 October 2015, followed up via email on 3 March 2016, 17 March 2017 and 23 March 2017.
[98] https://www.ordnancesurvey.co.uk/docs/user-guides/code-point-user-guide.pdf, page 7, Basic Principles.
[99] BT's response dated 3 October 2017 to section 135 information request, question 1.2, dated 19 September 2017, BT's response dated 3 October 2017 to section 135 information request, question 1.5.
[100] https://www.ordnancesurvey.co.uk/business-and-government/products/address-layer-2.html.
[101] Ordnance Survey had withdrawn MasterMap® Address Layer 2. AddressBase Plus represented an evolutionary step from the MasterMap® Address Layer 2.
[102] Ofcom's Wholesale Broadband Access Market Review, Consultation on market definition, market power, determinations and remedies, paragraphs A8.14, A8.15, page 211.
[103] For historical reasons, in this document we use the term "Delivery Point" ("DP") interchangeably with the term "premise".
[104] WBA Consultation, paragraphs A8.14 and A8.15, page 211.

BT's response to the consultation

A6.20 In response to our 2017 WBA Consultation, and more specifically in relation to our geographic markets analysis, BT suggested that we should:

- use a consistent dataset to identify the number of DPs in both the WBA review and our Connected Nations analysis to minimise mismatched postcodes;
- ensure our analysis is updated on the best available data;
- include FTTP rollout or planned fibre build by other operators, and
- improve the calculation of the number of UK premises.[105]

A6.21 Furthermore, BT expressed concern that the dataset we used for the consultation (in order to estimate the number of DPs in each Exchange Area) underestimated BT's fibre network coverage.[106]

A6.22 BT said it would provide updated data to help reduce the mismatched postcodes, as well as to provide additional data to address issues in Ofcom's data where postcodes are served by multiple exchanges.[107]

A6.23 Subsequent to its consultation response, *BT informed us that they were aware of a dataset of broadband premises that Ofcom had defined for the purpose of preparing data for Ofcom's Connected Nations reporting; and suggested this might be an appropriate starting point*.[108]

Our approach in this Statement

A6.24 We have considered the points raised by BT in response to the consultation. We have used new estimates supplied by BT, on DPs passed by its FTTC network, based on Ordnance Survey's AddressBase Premium dataset for Great Britain and NI Pointer for Northern Ireland. It only considered those DPs which can be served by the copper access network.[109] Similarly, we have updated our analysis, to use data on UK premises prepared on the same basis as our Connected Nations Data Analysis.[110] Our approach is explained in more detail, below.

A6.25 FTTP rollout and planned fibre build by other operators have not been included in the estimation of fibre network coverage. We set out our reasoning for this decision in section 4, paragraphs 4.90-4.98.

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[105] BT's response dated 14 September 2017 to 2017 WBA consultation, Annex 3, paragraph 17-19, page 44.
[106] BT's response dated 14 September 2017 to 2017 WBA consultation, Annex 3, paragraph 23, page 44.
[107] BT's response to Ofcom's WBA Consultation (22 June 2017), page 16, paragraph 3.37.
[108] [✂].
[109] BT's response dated 17 January 2018 to question 1.2 of the section 135 notice dated 21 December 2017.
[110] Connected Nations 2017 Data Analysis, https://www.ofcom.org.uk/__data/assets/pdf_file/0016/108511/connected-nations-2017.pdf.

Exchange size calculation

A6.26 Our analysis to estimate the exchange size by number of DPs in each exchange, relies on work undertaken to prepare the Connected Nations datasets,[111] to identify premises eligible for broadband.[112] The Connected Nations dataset relies on premises data from the Ordnance Survey (OS) AddressBase® Premium dataset[113] (May 2017 version, Epoch 49) and the OS AddressBase® Islands dataset (May 2017 version, Epoch 49). This has been combined with additional geographic classifications from the ONS National Statistics Postcode Lookup (NSPL)[114] (May 2017 version) and Urban and Rural categories derived from the Locale classification[115] (February 2017 version). Unique Property Reference Numbers (UPRNs) are built in, and UPRNs with PO Box numbers have been excluded. UPRNs where Local Custodian Code is 7655 have also been excluded.[116] Small ("S") and Large ("L") premises have been included.

A6.27 The premises database that we used features 29,148,471 records. This is 1.82% higher than the DPs identified in the last market review (28,627,237) and we believe this increase is likely due to more detailed information on multiple occupancy premises, but lower than the number of premises we identified in the 2017 WBA consultation, as a result of the application of different requirements/filters in the identification of premises eligible for delivery of broadband connections, for our Connected Nations data.[117] We expect that many of these newly identified multiple occupancy premises are in urban areas rather than rural areas.

A6.28 We finally counted the number of records, for each postcode, to estimate the number of DPs, and removed postcodes not served by BT's network in the Hull Area.

A6.29 The next step in our analysis is to estimate the total number of DPs in each exchange (the exchange size). To do this, we map each UK DP to a local exchange, by combining our Connected Nations' premises data for UK postcodes with BT's data which maps UK postcodes to each exchange.[118] This allows us to estimate the size of each local exchange, in terms of the total number of DPs served.

A6.30 A small amount of data loss occurs in this process because: (i) some postcodes are being served by two or more exchanges; and (ii) some postcodes could not be matched.

A6.31 We considered several ways of allocating DPs to exchanges, to avoid double counting of postcodes being partly served by more than one exchange.

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[111] Connected Nations 2017 Data Analysis, https://www.ofcom.org.uk/__data/assets/pdf_file/0016/108511/connected-nations-2017.pdf.
[112] [✂].
[113] https://www.ordnancesurvey.co.uk/business-and-government/products/addressbase-products.html.
[114] http://www.ons.gov.uk/ons/guide-method/geography/products/postcode-directories/-nspp-/index.html.
[115] http://www.bluewavegeographics.com/images/LOCALE_Classification.pdf.
[116] Custodian Code 7655 is assigned to objects maintained by Ordnance Survey that include Royal Mail and industrial infrastructure, and water bodies.
[117] Connected Nations 2017 Data Analysis, https://www.ofcom.org.uk/__data/assets/pdf_file/0016/108511/connected-nations-2017.pdf.
[118] BT response dated 17 January 2018 to question 1.2 of the section 135 notice dated 21 December 2017.

A6.32 Using the most up-to-date data, we identified 57,620 postcodes being served by two or more different exchanges. These correspond to 1,077,351 DPs (3.69% of the total number of DPs in the UK).

A6.33 BT supplied additional, more detailed, information on numbers of premises served by each exchange in each postcode. We used this information to estimate the proportions of DPs served by each exchange in each postcode and apply these ratios to the Connected Nations' estimated DPs data, at the postcode level.[119] We consider that the difference between BT's and our Connected Nations' estimated DPs is likely due to minor differences in the criteria used to identify the premises that are eligible for broadband. Where BT's data indicated zero DPs within a postcode being served by multiple BT exchanges, we allocated an equal number of unmatched DPs to each of the exchanges, i.e. equal to the total number of DPs in the postcode divided by the number of exchanges that serve the postcode.

A6.34 For this statement, we were unable to match 2.94% (49,927) of BT's postcodes to our Connected Nations data, as well as 0.052% (15,357) of all UK DPs in postcodes from our Connected Nations' data that we could not match to BT's exchanges.[120] We compensated for this by uplifting the number of DPs in each exchange area by 0.3 DPs (15,357/49,927) for each unmatched postcode served by each exchange area.

Data on active circuits

A6.35 We have used data received from telecoms providers to assess where they are present in providing telecoms services.

A6.36 The data from Openreach on active circuits includes broadband connections provided via MPF and SMPF on BT's copper network (either by BT's downstream divisions or by an LLU operator) and via superfast broadband connections provided via Openreach's fibre-enabled cabinets (GEA).

A6.37 For network operators (Sky, TalkTalk) that use MPF lines for telephony, to support GEA FTTC for broadband, we deducted from the MPF lines an operator consumes at a local exchange the FTTC lines being served by Cabinets connected to the local exchange, to prevent double counting. Where the number of FTTC lines was greater than the number of MPF lines, we assumed that all MPF lines were used for GEA.

A6.38 The data from Virgin Media includes active circuits using its cable network.

A6.39 We recognise that some active circuits will be used for services found to be outside the relevant product market, such as symmetric services including Ethernet in the First Mile (EFM). Given the low proportion of the active circuits that fall outside the WBA market, we do not believe this is likely to have a significant effect on our analysis.

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[119] Connected Nations 2017 Data Analysis, https://www.ofcom.org.uk/__data/assets/pdf_file/0016/108511/connected-nations-2017.pdf.

[120] BT response dated 17 January 2018 to question 1.2 of the section 135 notice dated 21 December 2017.

A6.40 Also, BT's FTTC Working System Size data was missing the name of the network operator for 2.81% of GEA lines. These records were excluded from our analysis.

The principal operators

A6.41 As discussed in paragraphs 4.58 to 4.62, we have defined five principal operators (POs) upon which our forward looking geographic market assessment is based. These are BT, Sky, TalkTalk, Virgin Media and Vodafone.

LLU roll-out plan data

A6.42 We have analysed data on telecoms providers' planned roll-out of infrastructure to take advantage of LLU. The information on future roll-out plans identified the stages of each telecoms provider's most recent forecast roll-out plans based on Openreach's infrastructure planning process, namely:

- Step 1: Advanced Provisioning Order (APO) submitted by telecoms provider;
- Step 2: APO survey completed by Openreach;
- Step 3: Firm order submitted by telecoms provider;
- Step 4: Multi User Area (MUA) build completed by Openreach; and
- Steps 5 and 6: Point of Presence (POP) install completed and handed over to telecoms provider.

A6.43 The first two steps provide telecoms providers with a view on whether their proposed roll-outs are feasible or not. Once Openreach responds (step 2), telecoms providers may confirm their order to Openreach (step 3). On receipt of a firm order Openreach carries out the necessary work to prepare, build and handover the LLU space to the telecoms provider (steps 4 to 6).

A6.44 We consider planned LLU roll-out at either step 1 or 2 as "uncommitted", since there is little commitment to proceed with the order (or penalty associated with not proceeding). Once a firm order is submitted (step 3) we consider the roll-out to be "committed" because we consider it unlikely that an operator reaching step 3 (the 'Firm order received' stage) would reverse its decision to unbundle the exchange. This distinction between "committed" and "uncommitted" roll-out is consistent with our approach in the 2014 WBA Statement.[121] We only include "committed" planned roll-out into our allocation of exchanges into geographic markets.

BT's FTTC network and overlap calculations

A6.45 Alongside its copper network, BT has made significant progress in the deployment of FTTC. Its FTTC deployment is served from a subset of its local exchanges (which we call fibre-serving exchanges). Fibre-serving exchanges serve significantly wider geographic areas than a copper exchange could serve for the provision of broadband. A fibre-enabled cabinet may be served via copper and fibre from the same exchange or from different

[121] 2014 WBA Statement, paragraphs 4.99 – 4.115.

exchanges. Similarly, different groups of cabinets in a copper exchange area will be served by the same copper exchange but may be served by different fibre-serving exchanges. Some cabinets will not be fibre-enabled at all.

A6.46 A telecoms provider can provide superfast broadband and related services to customers within a copper exchange area if its network reaches the corresponding fibre-serving exchanges. We used information that was supplied by BT to determine the fibre exchanges from which telecoms providers can reach customers via fibre-based services.[122] We considered a telecoms provider to be present in a fibre exchange when one of the following conditions is met:

- The telecoms provider has purchased GEA FTTC lines in cabinets being served by the fibre exchange, or
- The telecoms provider has rolled out LLU in the fibre exchange.

A6.47 Furthermore, we considered BT's current fibre deployment, as well as confirmed future rollout of fibre-enabled cabinets, where BT has told us that roll-out is planned to specific cabinets.[123]

A6.48 We considered a CP to be present in the geographic area served by a BT copper exchange if the coverage of the fibre network that the CP's network can reach via fibre-serving exchanges is greater than 65% (in terms of DPs in the copper exchange). We discussed the choice of this threshold in more detail in paragraphs 4.99-4.112.

A6.49 To calculate the extent of fibre coverage for comparison with this threshold, we used data provided by BT on its fibre access network: the location of each fibre-enabled cabinet, its copper and fibre serving exchange(s), the number of DPs a cabinet serves in each postcode and the number of FTTC lines it serves on behalf of each telecoms provider. Data on planned fibre rollout with a similar level of granularity was also provided by BT.

A6.50 Following the publication of the WBA Draft Statement we had a query from a stakeholder about two exchanges that had moved from Market B in the consultation to Market A in the draft statement. Further investigation revealed that there was an error in data provided by BT so that a limited number of cabinets were not included in the list of cabinets where FTTC had been rolled out [or was expected to roll out during the review period]. BT has provided updated data on the cabinets affected and we have included these in our analysis for this statement. The impact of this has been to move three exchanges (NSEVA, THCMN and THHD) from Market A to Market B – two of which (NSEVA and THCMN) we found were in Market B in the 2017 WBA Consultation. The remainder of the cabinets affected were in exchange areas that were already in Market B and therefore have had no impact on our geographic analysis.

[122] BT response dated 3rd October 2017 to questions 1.1, 1.3, 1.4 and 1.7 of the section 135 notice dated 19 September 2017.
[123] BT response dated 3rd October 2017 to question 1.4 of the section 135 notice dated 19 September 2017.

Virgin Media's network and cable overlap calculations

A6.51 Virgin Media provided data on its broadband cable coverage by specifying the number of DPs it can presently offer service to in each postcode and the number of DPs it is currently serving.[124] We confirmed that this data relies on assumptions that are in line with Ordnance Survey's CodePoint database.[125]

A6.52 Our choice of Ordnance Survey AddressBase Premium[126] in this market review means that some postcodes now appear to have a significantly higher estimated number of DPs compared to what was reported in CodePoint. Properties with multiple dwellings are identified correctly in AddressBase Premium (as multiple DPs), while CodePoint may identify only the building or block (as a single DP). To compensate for this, we calculated an uplift factor/adjustment for each UK postcode that is equal to the proportion of DPs reported in AddressBase Premium over the number of DPs reported in CodePoint; we then applied this uplift factor to Virgin Media's estimates.

A6.53 Furthermore, since Virgin Media's footprint does not align exactly with BT exchange areas, we have had to map Virgin Media's network onto BT's local exchange areas, to assess competitive conditions within each exchange area (our relevant geographic unit).

A6.54 From the postcodes and premises data provided by Virgin Media,[127] 6,479 postcodes (0.95%) could not be mapped onto any of BT's local exchanges.

A6.55 To deal with the issue, we uplifted the number of premises Virgin Media served or passed in other areas by the proportion of postcodes (and corresponding premises) that could not be mapped. The unmapped premises account for 0.05% of the total number of DPs passed. The corresponding uplift factor is small and it is very unlikely to affect our assessment. As such, we have attempted to reduce the mismatch of postcodes but, taking into consideration that the underlying datasets are provided by different stakeholders and they are based on different databases of UK postcodes, we do not consider it practically feasible to perfectly match all postcodes.

A6.56 In terms of UK DPs, Virgin Media coverage increased [✂] between October 2015 and January 2018.[128] The increase is partly attributed to additional network being rolled out by Virgin Media, as well as the fact that we are using new, more detailed data on premises with multiple occupancies, typically in urban, densely populated areas (as explained earlier).

A6.57 As set out in Section 4, we consider Virgin Media as being present within a local exchange area when the overlap is at least 65%. In January 2018, there were 922 local exchanges

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[124] Virgin Media response dated 31 January 2018 to questions 1 and 2 of the section 135 notice dated 16 January 2018.
[125] Virgin Media email, 6 September 2016.
[126] Connected Nations 2017 Data Analysis, https://www.ofcom.org.uk/__data/assets/pdf_file/0016/108511/connected-nations-2017.pdf.
[127] Virgin Media response dated 31st January 2018 to question 1 of the section 135 notice dated 16 January 2018.
[128] Ofcom calculations based on BT response dated 17 January 2018 to question 1.2 of the section 135 notice dated 21 December 2017,
and Virgin Media response dated 31st January 2018 to question 1 of the section 135 notice dated 16 January 2018.

where Virgin Media's coverage is at least 65%.[129] In comparison, at the end of October 2015, there were 805 local exchanges where Virgin Media's coverage was at least 65%.[130]

A6.58 We have not considered Virgin Media's roll-out plans, for reasons explained in paragraph 4.67.

Grouping of exchanges and sensitivity analysis

BT's non-broadband exchanges

A6.59 As mentioned in A6.15, there are 26 local exchanges where BT has confirmed it does not provide broadband services, using copper from that local exchange. However, the wider range of BT's fibre network means that some of these geographic areas, previously served only by copper, now have access to fibre-enabled cabinets and corresponding broadband services.

A6.60 We found that 16 of the 26 non-broadband local exchange areas are now partly served by fibre and half of these are classified in Market B, as follows.

Market A (8 exchanges): NSGRO, NSBRN, NSCRN, NSERI, NSLMD, NSLPT, NSNBY, NSSOL.
Market B (8 exchanges): SDPLSTW, NSNTT, EAPRI, NSCWY, NSBVS, NSSPY, NDISF, NSLEV.

A6.61 In NSCRN, NSGRO and NSLPT, BT's fibre reaches less than 65% of premises. In the remaining 5 exchange areas, NSBRN, NSERI, NSLMD, NSNBY and NSSOL, fibre coverage is above 65%, but with only 2POs (i.e. BT+1) being present and so are not classified as Market B exchanges (as explained below and section 4, paragraph 4.116 et seq.).

A6.62 The remaining 10 non-broadband local exchanges are classified in Market A and correspond to an estimated 1,487 DPs (0.0051% of UK DPs).[131] The relevant exchange codes are: NSBAY, NSBNS, NSDRN, NSGRE, NSMAN, NSSCP, NSSST, NSTIM, SDSTMRD and SDSTTN.

A6.63 If we add the 3 exchanges (NSCRN, NSGRO and NSLPT), where fibre coverage is below 65%, to the remaining 10 non-broadband local exchanges, we identify a total of 13 exchange areas without any POs being considered present.

Geographic markets analysis

A6.64 Once we have determined the exchanges in which we consider POs to be present we allocate exchanges into two distinct geographic markets. We place exchanges where only BT, or BT+1PO are present into Market A and exchanges where BT+2 or more POs are present into Market B.

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[129] Ofcom calculations based on BT response dated 17 January 2018 to question 1.2 of the section 135 notice dated 21 December 2017,
and Virgin Media response dated 31st January 2018 to question 1 of the section 135 notice dated 16 January 2018.
[130] Ofcom WBA 2017 Consultation.
[131] Our analysis does not include information on small, regional FTTP providers, which may serve some of these premises.

A6.65 In summary, the two geographic UK WBA markets excluding Hull are shown in Table A6.3 below.

Table A6.3: Geographic markets as at January 2018

	Number of exchanges	UK coverage[132]
Market A	707	0.89%
Market B	4,865	99.11%

Source: Ofcom calculation from data provided by Openreach, Virgin Media and KCOM

Sensitivity analysis to committed roll-out

A6.66 For POs using LLU (excluding BT), we consider planned LLU deployments as explained in paragraphs A6.42 to A6.44 above. As explained in paragraph 4.47, we have not included Virgin Media's planned network roll-outs in our assessment. We show the sensitivity to committed roll-out, as opposed to no roll-out, in Table A6.4 below.

Table A6.4: Impact of LLU and Fibre roll-out

	No. of exchanges and proportion of UK premises, without accounting for planned LLU & Fibre roll-out		No. of exchanges and proportion of UK premises, accounting for "committed" planned LLU & Fibre roll-out	
Market A	844	1.15%	707	0.89%
Market B	4,728	98.85%	4,865	99.11%

Source: Ofcom calculation from data provided by Openreach and Virgin Media[133]

Sensitivity analysis for Virgin Media and FTTC coverage threshold

A6.67 In response to our 2017 WBA Consultation, BT argued that, since more than one provider can enter the market on the basis of fibre, the competitive threat on the basis of fibre presence is greater than in the case of cable presence. BT considered that this means that in the case of fibre presence, a lower share of the exchange area can be covered in order to act as a competitive constraint compared to the case of cable presence.

[132] Excluding the area served by KCOM in Hull.
[133] Ofcom calculations based on BT responses to the s.135 Notices dated 21 December 2017 and 19 September 2017, and Virgin Media response to the s.135 Notice dated 16 January 2018.

A6.68 BT also argued that, since our analysis of PO presence at fibre handover points did not appear to include forecasts of future expansion of PO presence to further handover points, a 65% threshold based on today's PO presence is highly likely to miss many exchanges that over the course of the review period will pass the 65% threshold.

A6.69 To inform our geographic market assessment, we have conducted further analysis to consider the impact of changing the threshold that determines whether Virgin Media and BT's FTTC are present at the level of an exchange.

A6.70 Table A6.5 shows that no premises would be reclassified if only the cable operator's presence threshold is moved from 65% to 50%, or from 65% to 80%.[134]

Table A6.5: Impact of altering cable operator presence threshold only

	No. of exchanges and proportion of UK premises where threshold >=50%		No. of exchanges and proportion of UK premises where threshold >=65%		No. of exchanges and proportion of UK premises where threshold >=80%	
Market A	707	0.89%	707	0.89%	707	0.89%
Market B	4,865	99.11%	4,865	99.11%	4,865	99.11%

Source: Ofcom calculation from data provided by Openreach and Virgin Media[135]

A6.71 We repeated this exercise for both networks, i.e. the cable operator and BT's FTTC. Table A6.6 shows that, if the threshold is moved from 65% to 50%, 0.26% of premises would be reclassified and, if the threshold is moved from 65% to 80%, 0.49% of premises would be reclassified.[136] We also set out the impact of the sensitivity to the thresholds in paragraph 4.106.

Table A6.6: Impact of altering cable and fibre operator presence threshold

	No. of exchanges and proportion of UK premises where threshold >=50%		No. of exchanges and proportion of UK premises where threshold >=65%		No. of exchanges and proportion of UK premises where threshold >=80%	
Market A	565	0.63%	707	0.89%	937	1.38%

[134] Ofcom calculations based on BT responses to the s.135 Notices dated 21 December 2017 and 19 September 2017, and Virgin Media response to the s.135 Notice dated 16 January 2018.
[135] Ofcom calculations based on BT responses to the s.135 Notices dated 21 December 2017 and 19 September 2017, and Virgin Media response to the s.135 Notice dated 16 January 2018.
[136] Ofcom calculations based on BT responses to the s.135 Notices dated 21 December 2017 and 19 September 2017, and Virgin Media response to the s.135 Notice dated 16 January 2018.

	No. of exchanges and proportion of UK premises where threshold >=50%		No. of exchanges and proportion of UK premises where threshold >=65%		No. of exchanges and proportion of UK premises where threshold >=80%	
Market B	5,007	99.37%	4,865	99.11%	4635	98.62%

Source: Ofcom calculation from data provided by Openreach and Virgin Media[137]

A6.72 This analysis takes into account existing FTTC rollout as well as confirmed future FTTC rollout plans.[138]

Comparison with the 2014 WBA Market Review

A6.73 Table A6.7 provides a comparison between the market definition (excluding the Hull Area) in the 2014 WBA market review and our proposed market definition in this statement. It shows the number of exchanges classified in Markets A and B in 2014, further broken down by the number of POs. The table compares this with the number of exchanges we propose to classify in Markets A and B in this statement, again broken down by number of POs.

Table A6.7: Breakdown of exchanges in Market A and Market B in the 2014 WBA market review and as identified in this review

	Exchanges in 2014			Exchanges for this review	
Market A	3,196	26	Non-BB exch.	13	707
		2,508	BT only	626	
		662	BT + 1	68	
Market B	2,390	1,124	BT + 2	158	4,865
		721	BT + 3	3820	
		545	BT + 4	887	

Source: Ofcom calculation from data provided by Openreach and Virgin Media

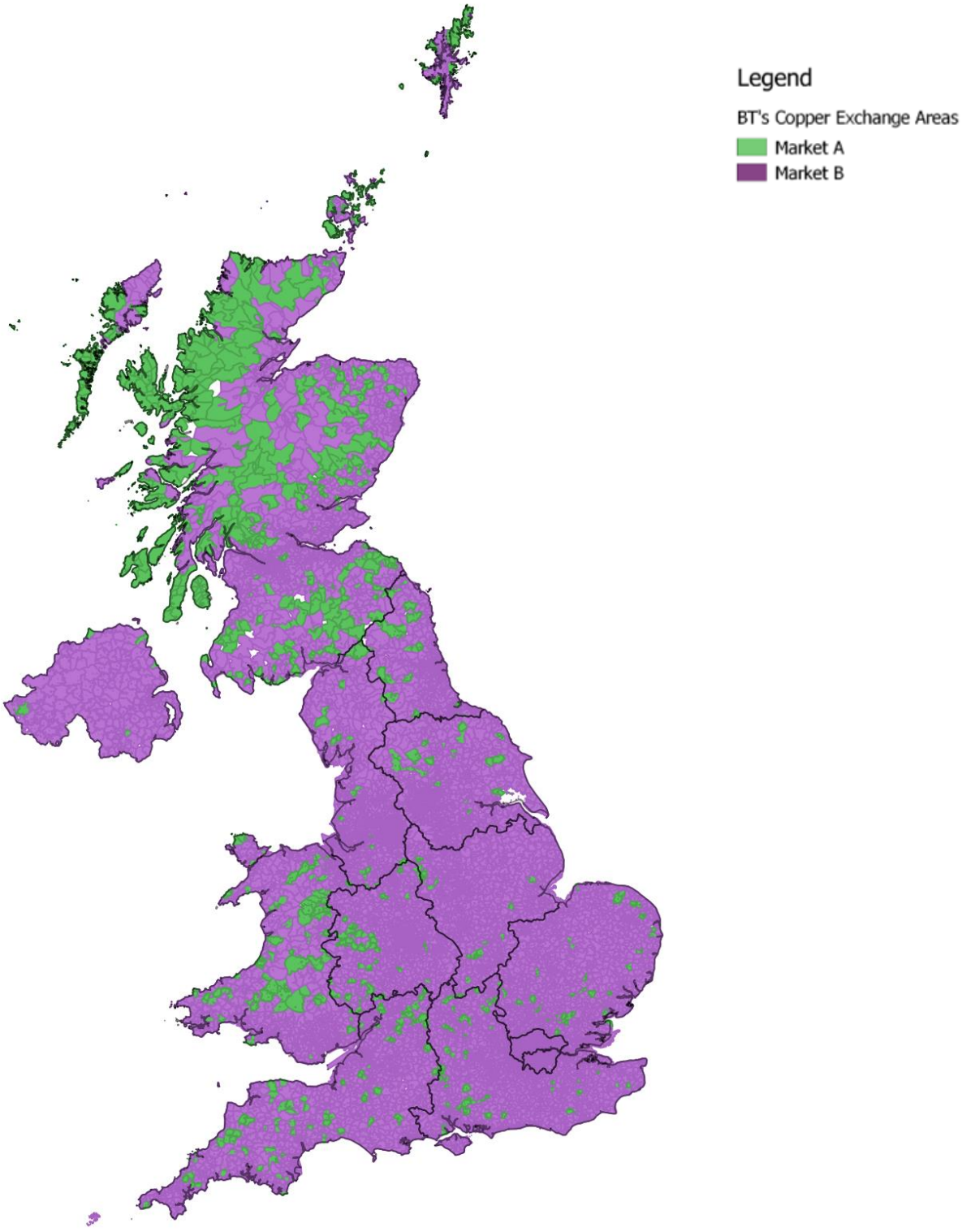
[137] Ofcom calculations based on BT responses to the s.135 Notices dated 21 December 2017 and 19 September 2017, and Virgin Media response to the s.135 Notice dated 16 January 2018.

[138] As set out in paragraph 6.50, we have updated the geographic analysis to account for an error in the data provided by BT on a limited number of cabinets that have had FTTC rolled out (but this was not identified in the information provided for the statement).

Map of geographical coverage of markets

A6.74 Figure A6.8 provides a geographic representation of Market A and Market B, highlighting those parts of the country covered by each Market.

Figure A6.8: Geographical map of Market A and Market B



A7. Equality Impact Assessment

Introduction

A7.1 Ofcom is required by statute to assess the potential impact of all our functions, policies, projects and practices on the following equality groups: age, disability, gender, gender reassignment, pregnancy and maternity, race, religion or belief and sexual orientation.[139] An equality impact assessment (EIA) also assists us in making sure that we are meeting our principal duty of furthering the interests of citizens and consumers regardless of their background or identity.

A7.2 Unless we state otherwise in this document, it is not apparent to us that our remedies will have a differential impact on any particular group of consumers or equality group.

A7.3 Further, we have not considered it necessary to carry out separate EIAs in relation to additional equality groups in Northern Ireland: political opinion and dependants.[140] This is because we anticipate that our regulation would not have a differential impact on people in Northern Ireland with those characteristics compared to consumers in general.

Equality impact assessment

A7.4 We have considered whether the remedies would have a differential impact on any particular group of consumers. In particular, we have considered whether the remedies would have a different or adverse effect on UK consumers and citizens with respect to the following equality groups: age, disability, sex, gender reassignment, pregnancy and maternity, race, religion or belief and sexual orientation, and, in Northern Ireland, political opinion and persons with dependants.

A7.5 The intention behind our approach to regulating WBA is to promote competition to the ultimate benefit of end consumers by, for example, requiring any telecoms provider with SMP to provide access to their network on regulated terms (including charging).

A7.6 Ofcom regularly carries out market research to understand how certain equality groups engage with communication services.[141] We have used this research to inform our equality impact assessment.

A7.7 While our research identifies some differences in take-up and use of fixed line services by different groups (e.g. based on age), our regulation is aimed at promoting competition across the range of services that rely on WBA. We therefore do not consider that our

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[139] Ofcom has a general duty under the Equality Act 2010 to have due regard to the need to eliminate discrimination, advance equality of opportunity between those who share a relevant 'protected characteristic' (age, disability, sex, gender reassignment, pregnancy and maternity, race, religion or belief and sexual orientation) and those who do not, and to foster good relations between persons who share a relevant protected characteristic and those who do not.

[140] In addition to the characteristics protected under the Equality Act 2010, under Northern Ireland equality legislation persons who have dependents or hold a particular political opinion are also protected.

[141] https://www.ofcom.org.uk/__data/assets/pdf_file/0015/101292/technology-tracker-data-tables-h1-2017.pdf and https://www.ofcom.org.uk/__data/assets/pdf_file/0029/96941/Disabled-consumers-access-and-use-of-communications-services-and-devices-2016.pdf.

regulation will have a differential or detrimental impact on any defined equality group. Rather, we consider that our regulation will further the interests of all consumers that use retail services reliant on WBA, including those that share relevant protected characteristics.

A8. Sources of evidence

A8.1 We have noted throughout this statement the evidence we have relied upon in relation to our findings and how we have relied upon that evidence. This annex lists the main sources of evidence used, including all responses to our consultations and to our formal s.135 notices requesting information.

A8.2 While this annex lists the main evidence we have relied upon, the list is for convenience only and is not intended to be exhaustive.

Responses to the June 2017 WBA Consultation

A8.3 On 22 June 2017, we published a consultation (2017 WBA Consultation), on proposed market definitions, SMP findings and remedies.

A8.4 Eight stakeholders provided written responses to this consultation:

- BT
- Intelsat
- TalkTalk
- UK Competitive Telecoms Association (UKCTA)
- Verizon
- Vodafone
- [✂]
- [✂]

A8.5 We have published non-confidential versions of the responses from the stakeholders listed above. These can be found on our website.[142]

Information gathered using statutory powers

A8.6 During this market review, we have issued a series of notices under section 135 of the Communications Act 2003 requiring various telecoms providers to provide specified information as set out in the notice. We have set out the information requests below by reference to the part of our statement where we mainly discuss the information received from stakeholders, and by stakeholder.

Notices addressed to and responses received from BT

A8.7 Notice of 8 October 2015. Response received in four tranches on 23 October, 6 November, 12 November and 25 November 2015.

A8.8 Notice of 19 February 2016. Response received on 4 March 2016.

A8.9 Notice of 19 September 2017. Response received on 29 Jan 2018.

[142] See https://www.ofcom.org.uk/consultations-and-statements/category-1/wholesale-broadband-access-market-review.

A8.10 Notice of 21 December 2017. Response received in three tranches on 9 January, 16 January and 30 January 2018.

A8.11 Notice of 16 May 2018. Response received on 23 May 2018.

Notices addressed to and responses received from CityFibre

A8.12 Notice of 11 April 2018. Response received on 27 April 2018.

Notices addressed to and received from Connexin

A8.13 Notice of 1 September 2016. Response received on 5 September 2016.

Notices addressed to and responses received from EE Limited (EE)

A8.14 Notice of 13 October 2015. Response received on 4 November 2015.

Notices addressed to and responses received from KCOM Group plc (KCOM)

A8.15 Notice of 23 October 2015. Response received on 16 November 2015.

A8.16 Notice of 26 March 2018. Response received on 11 April 2018.

Notices addressed to and responses received from MS3

A8.17 Notice of 31 March 2016. Response received on 29 April 2016

A8.18 Notice of 4 April 2018. Response received on 17 April 2018.

Notices addressed to and responses received from Post Office

A8.19 Notice of 15 October 2015. Response received on 2 November 2015.

Notices addressed to and responses received from Pure Broadband

A8.20 Notice of 1 September 2016. Response received on 6 September 2016.

Notices addressed to and responses received from Quickline

A8.21 Notice of 1 September 2016. Response received on 5 September 2016.

Notices addressed to and responses received from Sky

A8.22 Notice of 5 November 2015. Response received in two tranches on 27 November and 4 December 2015.

A8.23 Notice of 16 January 2018. Response received on 24 January 2018.

Notices addressed to and responses received from TalkTalk

A8.24 Notice of 19 October 2015. Response received in two tranches on 17 November 2015.

A8.25 Notice of 16 January 2018. Response received on 7 February 2018.

A8.26 Notice of 12 April 2018. Response received on 3 May 2018.

Notices addressed to and responses received from Virgin Media

A8.27 Notice of 16 October 2015. Response received in two tranches on 2 November and 30 November 2015.

Notices addressed to and responses received from Vodafone

A8.28 Notice of 14 October 2015. Response received on 16 November 2015.

A8.29 Notice of 12 January 2018. Response received on 25 January 2018.

Ofcom documents

A8.30 Ofcom, June 2017. *Wholesale Broadband Access Market Review – Consultation on market definition, market power determinations and remedies*

A8.31 Ofcom, 2011-18. *Connected Nations and infrastructure reports*

A8.32 Ofcom, 2016. *The Communications Market Report*

A8.33 Ofcom, 2016. *Connected Nations*

A8.34 Ofcom, 2015. *Connected Nations*.

A8.35 Ofcom, 2017. *Wholesale Local Access Market Review – Volume 1*

A8.36 Ofcom, 2017. *Consultation on Duct and Pole Access remedies*

A8.37 Ofcom, 2018. *Wholesale local access market review*

A8.38 Ofcom, 2014. *Review of the wholesale broadband access markets*

A8.39 Ofcom, 2016. *Designing the broadband universal service obligation - Final report to Government*

A8.40 Ofcom. *Communications Market Report 2016.*

A8.41 Ofcom, 2016. *Connected Nations 2016*

A8.42 Ofcom, 2017. *WLA Market Review – Consultation on the proposed market, market power determinations and remedies*

A8.43 Ofcom, 2017. *Consultation: WLA and WBA Market Reviews - Competition in the Hull area*

A8.44 Ofcom, 2016. *Telecommunications market data tables*

A8.45 Ofcom, 2016. *Making communications work for everyone*

A8.46 Ofcom, 2017. *Delivering a more independent Openreach*

A8.47 Ofcom, 2016. *Residential and business narrowband and broadband access, and fixed telephony*

A8.48 Ofcom, 2018. *Quality of service for WLR, MPF and GEA*

A8.49 Ofcom, 2017. *Automatic Compensation*

A8.50 Ofcom, 2014. *Regulatory Financial Reporting*

A8.51 Ofcom, 2015. *Directions for Regulatory Financial Reporting*

European Commission publications

A8.1 *Directive 2002/21/EC of the European Parliament and of the Council of 7 March 2002 on a common regulatory framework for electronic communications networks and services, as amended by Directive 2009/140/EC and Regulation 544/2009 (Framework Directive).*

A8.2 *Directive 2002/19/EC of the European Parliament and of the Council of 7 March 2002 on access to, and interconnection of, electronic communications networks and associated facilities (the Access Directive).*

A8.3 *Commission Recommendation of 19 September 2005 on accounting separation and cost accounting systems under the regulatory framework for electronic communications (2005/698/EC) (2005 EC Recommendation).*

A8.4 *Regulation (EC) No 1211/2009 of the European Parliament and of the Council of 25 November 2009 establishing the Body of European Regulators of Electronic Communications (BEREC) and the Office (the BEREC Regulation).*

A8.5 *Commission Recommendation of 20 September 2010 on regulated access to Next Generation Access Networks (NGA) (2010/572/EU) (2010 EC Recommendation).*

A8.6 BEREC, 2012. *Revised BEREC common position on best practice in remedies on the market for wholesale broadband access (including bitstream access) imposed as a consequence of a position of significant market power in the relevant market (BEREC Common Position on WBA).*

A8.7 *Commission Recommendation of 11 September 2013 on consistent non-discrimination obligations and costing methodologies to promote competition and enhance the broadband investment environment (C(2013) 5761) (2013 EC Recommendation).*

A8.1 BEREC, 2014. *Common Position on geographical aspects of market analysis (definition and remedies)*

A8.2 *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 (2014/710/EU) (2014 EC Recommendation).*

A8.3 *Explanatory Note accompanying the Commission Recommendation on relevant product and service markets within the electronic communications sector, 9 October 2014 (SWD(2014) 298).*

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