Vodafone response to Ofcom's consultation:

Promoting investment and competition in fibre networks

Approach to geographic markets

Non confidential version

March 2019

Contents

1. Executive summary

1.1 We share the Government's vision for UK broadband users to gain access to gigabit capable broadband services as soon as possible. We have entered into a partnership arrangement that will give one million homes access to Vodafone FTTP retail services from 2021.

1.2 Vodafone is also a significant retailer of high bandwidth enterprise services. We are the second largest fixed enterprise retailer in the market.

1.3 Our views are based on our experience operating in these two markets. Our experience shows:

There are practical benefits to reviewing the markets for broadband and leased lines at the same time.

1.3.1 Conducting the current market reviews in tandem allows for an absolute examination of the services provided to residential users and businesses over access infrastructure. This ensures that there is a consistent regulatory approach to issues, and that the needs of all user groups are taken into account when markets are considered and remedies are set.

The broadband and leased lines markets continue to be distinct with very different competition problems to be addressed

1.3.2 Ofcom needs to put in place regulation that addresses the competition problems in each market. It is very clear that there is a wide range of customer types, as both Ofcom's own extensive work across the various market reviews and our own experience shows. Residential and business customers have different bandwidth, technical and quality requirements. Business customers also have differing requirements across their range of sites, and businesses are charged differently to take account of the way their services are provisioned.

1.3.3 Ofcom has not identified how the different competition problems within leased lines and broadband will be addressed via a single geographic market approach. Leased lines users have a nationwide demand for services, which is very distinct from residential broadband. Ofcom has not made a convincing case that a generic light touch regulatory approach has merit for all UK consumers.

Networks are not able to rapidly change to serve new customer groups and network owners have customer strategies that focus their networks to customer types

1.3.4 Gigabit capable broadband networks and suppliers are different to those which provide leased lines. To upgrade a residential copper or coaxial network to become fully gigabit

capable is a massive undertaking for a network. Building a new FTTX network is again a massive undertaking. Residential surface networks using street cabinets are not used for leased lines services, which rely on the security of deep underground fibre facilities for service level standards. The network design and deployment is differentiated to meet the different service requirements. Businesses will seek to limit complexity and focus on the objective of rolling out fibre / gigabit capable broadband.

The established legal process for analysing markets needs to be followed to ensure that market review conclusions are both economically and legally sound

1.3.5 It is imperative that the market review exercise for the 2021 – 2026 period starts with the product market definition process. It is necessary to first determine the retail product market and how it is served by the wholesale market. This will clarify how service providers serving the retail market (due to their particular network assets and technology) function in the market today, and how they are able to serve a range of product markets for the period of the review. This is the recognised process of market analysis and competition assessment.

Ofcom needs to consider both the benefits and risks of its strategy proposals with a robust and transparent cost benefit analysis being used to support its final decision

1.3.6 Ofcom's intentions for regulation of prospectively competitive areas (as defined at present by Ofcom) is a cause for considerable concern. There is potential for a significant amount of harm to be caused through inadequate regulation and a lack of cost based regulation, especially where competition is uncertain. Inadequate regulation can result in consumers paying more, with no follow-on benefit. Inflated service pricing, which Ofcom proposes to allow, will encourage inefficient market entry based on unsustainable pricing signals. Ofcom has given little consideration to how today's high levels of retail broadband competition produces substantial consumer benefit, or how leased lines competition works.

Any transition away from the established regulatory regime requires detailed consideration, careful management and monitoring

1.3.7 The impact of the new proposed regime on the retail markets for the period of the review should be the key consideration. Broadband and leased lines markets have established customer bases, each with market specific customer switching profiles. In the case of leased lines, there are long contract terms, longer service transfer processes and very high barriers to switching. Careful consideration is required for the installed customer base within each market.

Geographic market segmentation should be far more detailed than a population density analysis. Ofcom should use a wider ranging input model.

1.3.8 The role of geographic market segmentation is to identify the areas of a product market that will have different market conditions compared to the UK in its entirety for the period of the review. The area of the UK that will actually be prospectively competitive and tending to be competitive by the end of the review period 2026 is far smaller than the area that Ofcom proposes to designate as prospectively competitive. By using a wider range of considerations when seeking to understand the geographic scope for competition, Ofcom will be able to improve the accuracy of its prospectively competitive geographic segment. This will lead to more appropriate regulation which will better protect consumers who need safeguards.

Transparent impact assessment

1.3.9 Ofcom should conduct a full impact assessment to understand how the policy proposals would impact consumer outcomes in each market.

2 Overview

Reviewing markets in tandem will deliver more comprehensive, robust regulation

2.1 We believe there is merit in Ofcom seeking to review markets in tandem, looking at connectivity across all business and consumer markets. This will help ensure that a consistent approach is taken across all the individual economic markets identified. This in turn will help to deliver a comprehensive and robust regulatory approach. Where key wholesale inputs –such as accommodation and network facilities – are used to underpin retail services in different markets (such as residential broadband, mobile backhaul and higher care enterprise connectivity), reviewing these services in combination ensures that all use cases are considered in parallel when remedies are reviewed.

2.2 This avoids the complication where key inputs for one market end up being considered in an adjacent market review. It also prevents the same asset from being both regulated and unregulated depending upon usage (e.g. DPA and accommodation space). For example, accommodation services have historically been considered within the Wholesale Local Access Market Review, but are of equal significance to the business connectivity market.

2.3 A broader based review will, however, result in a substantially larger market review task. It will continue to require economic rigour in understanding all of the related markets. This will mean much more analysis concentrated over a single time period, with more resources required for both Ofcom and industry.

Strategic aspirations do not override the need for a robust market definition exercise

2.4 The market review is an established process. Ofcom must start with a proper market definition exercise to identify distinct economic markets before going on to decide what regulation is required. Ofcom has conducted these definition exercises multiple times in the past and has consistently confirmed the existence of very distinct economic markets within the sector. The facts that led Ofcom to reach these conclusions still remain and Ofcom cannot credibly ignore or override them in favour of a more simplistic assessment focused on network access alone (being agnostic to the capabilities of the underlying network, the services available, or the demands of customers – both business and consumer – using that network).

2.5 Ofcom's current approach to determining market boundaries is unlikely to deliver robust results that stand up to even basic levels of scrutiny. This approach is based on Ofcom's strategic policy

aspirations to encourage greater independent network build. It seeks to look at services through a network-centric lens, which conflates markets into one larger, access-driven appraisal. But such an approach fails to consider the wide range of products available, the different types of consumers served and the wide variation in networks (including network capabilities) in existence and importantly the business strategies of network owners and the customer segments they intend to serve. The existence of this degree of variation across the sector is backed up in considerable detail by Ofcom's own previous differentiated analysis.

2.6 Taking short cuts in the market review approach and failing to either recognise or regulate individual markets properly will not lead to the stability and confidence that investors need to invest in the sector.

2.7 There is a legal framework which needs to be adhered to.

Ofcom's previous market definition conclusions can't be ignored

2.8 Ofcom's own past work of undertaking detailed product and market focused analysis[1] to inform market definition remains as imperative as ever. This is a vital exercise for an economic regulator to undertake, capturing the scope of the various product markets in existence, looking at the needs of a wide range of customers (from high end enterprises and mobile providers to standard broadband users and exchange line only customers). The outcome of this analysis needs to be considered alongside the availability and affordability of the various products and their functionality.

2.9 In its effort to understand the underlying demand for various services and the substitutability between those services, Ofcom has historically arrived at a very clear understanding of the delineators and boundary points of various product markets. This analysis, when combined with robust geographic analysis around availability, is key to ensuring that market power is remedied and that customers, both business and residential, are safeguarded.

---

[1] For example: https://www.ofcom.org.uk/consultations-and-statements/category-1/business-connectivity-market-review-2016
https://www.ofcom.org.uk/consultations-and-statements/category-2/business-connectivity-mr
https://www.ofcom.org.uk/consultations-and-statements/category-1/bcmr
https://www.ofcom.org.uk/consultations-and-statements/category-1/wholesale-local-access-market-review
https://www.ofcom.org.uk/phones-telecoms-and-internet/information-for-industry/telecoms-competition-regulation/narrowband-broadband-fixed/fixed-access-market-reviews-2014
https://www.ofcom.org.uk/__data/assets/pdf_file/0027/37935/wla_statement.pdf
https://www.ofcom.org.uk/consultations-and-statements/category-1/wbamr07

New additional fibre investment in enterprise connectivity is less likely

2.10 Ofcom need to recognise the very different fibre starting point in the enterprise market compared to the consumer market. The vast majority of enterprise customers already have access to fibre and are unlikely to want to spend valuable funds duplicating what they already have.

Not all Networks are equal

2.11 We understand Ofcom's plan is to take a simplified view of the availability of network infrastructure and the theoretical ability of that network to be able to serve the full range of market segments. Practical realities prevent this from being a realistic approach. Putting aside the crucial issues of geographic availability, and the cost considerations around connecting to a network even when it is in close proximity, the reality is that not all networks are capable of serving all products or indeed all types of consumer.

2.12 Networks have very different capabilities, from overall bandwidth and upload and download speeds to resilience, care levels and technical configuration. In reality the networks themselves have been designed with their target customer in mind. Enterprise networks have deeper ducts with uncontended, symmetrical high bandwidth Ethernet capabilities, while residential cable has asymmetric TV distribution as its guiding design architecture.

2.13 The range of network types is extensive. At one end there is the legacy copper network, which in itself is able to deliver services ranging from a basic 64Kbit/s exchange line (where the line can fail to support even a basic broadband service) to G.Fast speeds of around 300Mbit/s in some cases. The cable network can support speeds of up to 350Mbit/s on Coaxial cable today. However, with both cable and G.Fast, the uplink speeds are massively constrained. With TV distribution architecture, broadband has been retrofitted over the cable network, and this has constrained the shape of the service offering.

2.14 Consumer Fibre to the Home networks can typically deliver services at or approaching 1Gbit/s downlink, with slower uplink speeds (again based on a shared network architecture). In contrast, a symmetrical grade business connectivity network can typically deliver bandwidth of up to 100Gbit/s, with low latency and care levels that meet the needs of enterprises.

2.15 In most cases, it is not possible to reconfigure the access networks to offer the full range of services. The investment required would be considerable. In the case of the copper network, widespread fibre replacement is necessary. For the legacy cable network (including a major part of Virgin Media's Project Lightning which is coaxial led), a similar upgrade is necessary.

2.16 Even in cases where full fibre is deployed, there can be very distinct differences between network capabilities. For example, FTTH is a very different deployment from leased lines due to differences in the technology treatment of these services, including service levels and how the traffic is treaded across core infrastructure.

2.17 The range of differing network capabilities extends beyond the access medium for the connection itself (copper, coaxial cable or fibre), with radically different approaches to ducting and lead ins and drop wires deployed in each case. In the case of lead ins/drop wires, these may only be engineered for the type of cable deployed, with overhead drops for copper not suitable for fibre deployment without substantial modification. In the case of coaxial lead ins, these are often directly buried and can't be used. In multiple tenancy buildings where a cable tray conduit is used as for copper and cable as a ducting route, these are often full and can't be retro fitted for new fibre deployment. Likewise the break points in the various networks are different and may lack the space to offer the opportunity of re-use for another network use.

2.18 FTTH access is lower cost, with different performance characteristics than an optical Ethernet service (which is operated to strict latency characteristics across our network).

2.19 For leased line, the physical infrastructure is reserved for dedicated customer solutions, while FTTH technology allows for the sharing of infrastructure between large amounts of subscribers.

2.20 The physical fibre infrastructure can be terminated using a variety of optical equipment and technology. For leased lines, the equipment is dedicated to single use of fibre and wavelengths to a specific customer and location. In contrast, FTTH services have a significant degree of aggregate capacity in the backhaul network.

2.21 These technology differences are reflected in the network economics and the investment case between Fibre Ethernet (dedicated services) and Passive Optical Networks (broadband services) which are fundamentally different, with FTTH services being less capital intensive per connection than leased lines.

2.22 These differences are not just accounted for by the increased aggregation that takes place in FTTH networks. The physical infrastructure requirements of leased lines are often more demanding, with dedicated routes to minimise the potential for service disruption. In contrast, FTTH fibre utilises shared infrastructure where possible, with use of overhead cabling, slot trenching in footways and external termination of service without protection in some cases. These differences make it very difficult to consider a model where one network is capable of serving all services.

2.23 Network owners have and continue to focus on serving particular customer segments. The obvious target and priority of new FTTx rollout has been to provide the latest generation of broadband to those that are capped on copper based connections. There is no evidence from markets with more mature FTTx rollout that the FTTx rollout changes the established leased lines markets. This is due to the very different competition conditions and customer requirements for leased lines.

Both legacy copper and cable networks need upgrading

2.24 Ofcom and Government have made clear that they wish to have three competing full fibre, gigabit capable networks in a material proportion of the country. For this to happen, both legacy cable and copper networks need to be upgraded so that current network companies can offer full gigabit services. This is a substantial and longer term activity.

2.25 New market entrants need to find either a market niche that can support three network providers, or obtain first mover advantage in geographies where Openreach or Virgin are slower to roll out.

Understanding the importance of wholesale competition is vital

2.26 The current regulatory model focuses regulation on the wholesale market. The availability of regulated wholesale inputs, ranging from MPF to GEA, has created a successful retail consumer broadband market with a good range of supplier choice. While these suppliers are constrained by the shape of the underlying wholesale product, they have been able to differentiate through the choice of router, pricing, features and service bundling available.

2.27 From a residential user's perspective, this means there are often 10+ suppliers available, each offering a variety of packages to residential users. If Ofcom were to deregulate and remove the obligation to sell wholesale services, it is possible that retail choice may fall. Today, Virgin does not offer wholesale services on its network, and while other business models may choose to go down the wholesaler route, this is by no means guaranteed. If BT were to stop wholesaling in competitive areas, customers may only be left with three supplier choices.

2.28 Ofcom also need to consider the likelihood that BT's retail lines of business (BT, PlusNet and EE), which have considerable clout in the retail market, will all by default place their business with Openreach. Openreach doesn't have to fight to win these customers, and legal separation offers no remedy to this. This guarantee of business could well have a long term impact on the market and the comparative strength of the various network owners.

2.29 For retail providers who are not aligned to a network owner, the issue of switching will be a key consideration over the longer term, ensuring that customers can switch underlying access network with relative ease. There are very considerable practical obstacles to this, not least the fact that

customers don't tend to have a new network termination point installed in their homes until they select an alternative supplier.

2.30 Ofcom need to give very careful thought to the impact on the retail market in the event of any changes to wholesale regulation.

Phased investment cycles mean prospects for competition can be overstated

2.31 Ofcom should consider a range of different variables in its approach and model these to determine what impact they would have on outcomes. We discuss a potential model later in this response. Factors to consider include the order of who invests and the phased nature of investment plans. For example, if the first phase does not deliver on its financial and customer projections, then it puts subsequent phases in jeopardy. This can result in re-plans, the scaling back of subsequent phases and even the abandonment of all future investment plans. Investors typically do no commit to large roll outs without significant caveats.

2.32 This phased approach is entirely rational, but it does mean that the prospect of competition can often be overstated. We have seen BT announce many false starts on fibre investment, with big announcements and the associated PR around them, only to have those plans quietly shelved in the months or years that follow.

The order of investors matters

2.33 Who invests first can often have a significant bearing on outcomes. Newer, weaker investors without existing network assets in the area will always seek to gain first mover advantage. They lack the incumbent's advantages, such as a legacy network already in place (or an existing network in an adjacent area – which is important for infill investment), and a large retail base of guaranteed end users. For these weaker investors, being first to deliver full fibre in an area and gain from that new fibre bounce is key, helping them to achieve a higher conversion rate.

2.34 More established players, such as BT, have several advantages. They gain considerably from the ubiquity of their network, and can turn off the legacy copper network to generate opex savings as well. These players are much more likely to choose to invest even if they are the second or third investor in a geography to do so. ✂ To date there has, unsurprisingly, been no announcement from other fibre investors to overbuild any of Openreach's known 'Fibre Cities' once they have been announced by the incumbent.

2.35 The order of investors issue tells us that in places where Openreach is the first investor, there is far less likelihood that newer and weaker investors – who lack legacy assets and the sweetener of potential opex savings – will follow.

2.36 The phased nature of investments and the order of investors should be a key parameter in Ofcom's thinking on clusters and needs to be carefully considered. Recognition of BT's massive incumbency advantage as a fibre investor needs to be taken into account. BT's biggest headache is not whether its fibre investment plans will pay off. Rather, it is how to deter others from investing while still attracting the largest possible return from its legacy copper base with the smallest amount of additional fibre capex invested.

Universal Service considerations need to be clarified

2.37 We would welcome clarity on how any Universal Service obligations (either around broadband or the existing telephony USO) come into play. What impact could the USO have on competitive areas where the cost to serve an individual customer might be unusually high?

The prospects for supporting multiple network infrastructures is uncertain

2.38 While traditionally viewed as a mobile operator, Vodafone is increasingly offering converged services. In other countries where we operate, we have purchased residential cable businesses and used DPA to roll out FTTH to provide a consumer fixed and broadband service offering.

2.39 In the UK, we have purchased a fixed enterprise network. As a result, we are the largest enterprise competitor to BT.

2.40 In the UK, we aim to serve residential customers via the purchase of wholesale services rather than our own network build. Where there is a scale alternative competitor supplying wholesale services, we would seek to partner with them. At this time the geographic scope of wholesale provision network is uncertain, as is the extent of the UK geography that can support multiple network infrastructures.

3 Empirical evidence from other countries

3.1 In this section we discuss the manner in which FTTx network build and roll out has occurred in EU countries that are at a more advanced stage, highlighting key trends:

3.1.1 We find that areas which can economically support three or more alternative FTTx networks are limited to a proportion of the country – in Spain it is 35%.

3.1.2 We find that if the business strategy of an FTTx network builder is to offer wholesale access to the network, that lower levels of overbuild occur (e.g. Italy).

3.1.3 We find that the primary target of FTTx network build has been to serve the new higher bandwidth broadband market and not to contest the dedicated leased lines market.

3.1.4 Like the copper network, the cable network requires significant upgrade to offer gigabit capable broadband. Until that upgrade occurs, the legacy cable coverage is not counted as a competitive alternative.

Wholesale FTTx providers and partnership deals are key

3.2 As we look to other markets to understand the likely progression of the UK market, it is clear that the availability of wholesale access to FTTx networks influences the extent of FTTx network build that is likely to occur by new entrants.

3.3 In countries where there is a strong wholesale FTTx / wholesale only FTTx build proposition, retailers requiring access to FTTP services will not build duplicate infrastructure. Instead, they adopt a wholesale buying strategy. This can be seen particularly in Italy[2]. If we are to forecast the amount of overbuild that will occur and anticipate the extent of effective alternative network competition, it is necessary to consider the business strategy of both the network builders and the current broadband retailers who have existing customer bases to migrate.

3.4 There is also a trend for wholesale FTTx network sharing/partnership agreements occurring outside the most populous and economically attractive areas in a country. We can see this in evidence in

[2] http://www.astrid-online.it/static/upload/ee15/ee15dd20387f716c39d4823e71773e7c1.pdf

countries such as Spain and Portugal. In order to extend service reach to customers beyond the major city areas, retailers that are also network owners in some geographies have switched strategy from competing network build to wholesale access arrangements. In Spain, there are three major agreements involving co-investment and infrastructure-sharing commitments between four operators respectively, covering approximately 3 million, 6 million and 3 million building units. In Spain we have also seen the regulator mandate access to the incumbent network in areas lacking three or more network competitors. In Portugal there are network sharing arrangements in place where duplicate build has proven uneconomic.

3.5 It is necessary to understand the business strategies of the network builders in order to attempt to estimate the level of network overbuild and the prospects for effective network based competition.

3.6 Ofcom asked Analysys Mason to undertake a review of regulatory approaches outside of the UK[3]. We present below the tables from that report for Spain and Portugal where Vodafone is a FFTx network builder.

Figure 9.1: Summary of NGA regulation in Portugal [Source: Analysys Mason, 2015]

Network type	Regulation type	Geographic application	Point of interconnection	Symmetric / asymmetric	Pricing model
Implemented FTTH regulation (GPON network)	Vertical access	Nationwide	Local	Symmetric	FRND with cost orientation: the second operator to reach the building will pay 50% of the costs incurred in the installation of the shared vertical infrastructure, the third 33% and so on[368]
	Duct access	Nationwide	Local	Asymmetric	FRND with cost orientation[369]
	Duct access	Nationwide	Local	Symmetric	By Decree-Law 123/2009
Draft FTTH regulation (GPON network)	VULA	Nationwide, except for 17 municipalities with alternative fibre networks present	Not available (not quoted in the draft regulation)	Asymmetric	FRND with cost orientation: provide rationale to the regulator for pricing, taking into account the EC statement on cost orientation[370,371]

368 See http://organodivigilanza.telecomitalia.it/pdf/Seminario-UfficioVigilanza-14012015.pdf

369 See http://organodivigilanza.telecomitalia.it/pdf/Seminario-UfficioVigilanza-14012015.pdf, http://www.anacom.pt/streaming/analise_mercados4_5.pdf?contentId=812401&field=ATTACHED_FILE and https://circabc.europa.eu/sd/a/3a11b0d4-1198-471b-b906-c9becf99325f/Decis%C3%A3o%20ORAC.pdf

370 The EC states: "The price of access to the unbundled fiber loop should be cost-oriented". See http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32010H0572&from=EN

371 See http://www.anacom.pt/streaming/mercados4_5_consulta_15022012.pdf?contentId=1116435&field=ATTACHED_FILE

[3] https://www.ofcom.org.uk/__data/assets/pdf_file/0016/72025/international_case_studies.pdf

Figure 11.1: Summary of NGA regulation in Spain [Source: Analysys Mason, 2015]

Network type	Regulation type	Geographic application	Point of interconnection	Symmetric / asymmetric	Pricing model
Implemented FTTH regulation (GPON network)	Duct access	Nationwide	Local	Asymmetric	Price control, cost-based: the price per metre per month is calculated either by the cross-sectional area taken up or the operator is charged for a whole sub-duct or duct[455]
	Vertical access	Nationwide	Local	Symmetric	Price control, cost-based: the price agreement between Jazztel and Telefónica was taken as a reference, with a 15.29% premium to cover the WACC and NGA risk premium[456]
Draft FTTH regulation (GPON network)	Bitstream (NEBA)	Non-competitive areas: areas where Telefónica's market share exceeds 50% and there are not at least three other operators (LLU or cable), of which two have a market share of at least 10%	Regional (50 regions)[457]	Asymmetric	Economic replicability test[458] (regulation not finalised)
	VULA	Nationwide, except for nine cities which are defined as being effectively competitive[459]	Local (at the ODF, which is in a sub-set of local exchanges)	Asymmetric	Economic replicability test[460] (regulation not finalised)
	Vertical access	Nationwide	Local	Asymmetric	Price control, cost-orientation:
VDSL (VDSL-CO)	Bitstream (NEBA)	Nationwide below 30Mbit/s (non-competitive areas only for services above 30Mbit/s)	Regional (50 regions)[461]	Asymmetric	Price control, cost-based including a reasonable rate of return on the cost of capital and a risk premium of 15.72%[462]

455 See http://www.movistar.es/rpmm/estaticos/operadoras/servicios-regulados/oferta-acceso-registros-y-conductos-marco/06-precioscondicionesdefacturacion.pdf

456 See http://cnmc.es/Portals/0/Ficheros/Telecomunicaciones/Resoluciones/140618_Resoluci%C3%B3n_DTSA-692-13-Verticales-%20vPUBLICA_.pdf

457 See Annex 1, NEBA reference offer, February 2014. Available at http://telecos.cnmc.es/documents/10138/2026311/201402_Texto_consolidado_NEBA_feb2014.pdf/9131e7f8-07b7-4e83-aa27-f5f275837808

458 See http://www.cnmc.es/Portals/0/Ficheros/Telecomunicaciones/Consultas_Publicas/Consulta_cnmc/20141219_ProyectoMedida.pdf

459 The nine cities are: Madrid, Barcelona, Alcalá de Henares, Badalona, Cosiada, Málaga, Móstoles, Sevilla and Valencia.

460 See http://www.cnmc.es/Portals/0/Ficheros/Telecomunicaciones/Consultas_Publicas/Consulta_cnmc/20141219_ProyectoMedida.pdf

2004025-286

3.7 The data shows that there are economic limits to overbuild. Spain achieved higher levels of network competition in 9 cities and Portugal in 17. Wholesale regulation has been required and put in place outside the key cities.

New entrants' business strategies influence network build decisions

3.8 Retailers and network owners focus their services on segments of the market. FTTx build in EU countries has been focused on installing gigabit capable broadband in replacement of legacy broadband services (legacy copper and legacy cable) primarily to the residential customer segment.

3.9 It is evident that market entrants have their own business strategies, which influence the networks that they build and the customer markets they seek to serve. In Spain, Vodafone sought to move from a mobile only service provision model into a consumer fixed mobile converged service

provision model. Vodafone acquired a Spanish cable operator and upgraded the legacy cable network to become both gigabit and fixed mobile converged capable. Vodafone Spain also expanded the consumer network footprint by using DPA to build FTTH connections.

3.10 In Portugal Vodafone also sought to move from a mobile only service provision model into the wider consumer fixed market, now providing mobile, fixed internet, mobile internet and television services to residential customers.

3.11 In the UK we can see a range of sector focused suppliers emerging, with varying ambitions in different geographies and customer niches:

Builder	Business strategy
✂	✂
✂	✂
✂	✂
✂	✂
✂	✂
✂	✂

FTTx has not resulted in new dedicated leased line services

3.12 The construction of FTTx in other EU countries has not led to these broadband supply oriented networks seeking to provide dedicated leased line services.

3.13 Regulators continue to find separate broadband (EU Recommended Market M3a) and leased lines markets (EU Recommended Market M4). While the European Commission is looking at merging markets EU Recommended Market M3a and M3b, market M4 continues to be regarded as distinct.

3.14 The leased lines markets in countries with more mature FTTx deployments continue to operate as before in meeting the different needs of leased lines customers. In EU countries we find:

3.14.1 The network architecture for the technical solution to offer terminal leased lines is distinct from the network used to offer FTTP broadband services based on GPON architecture.

3.14.2 GPON network architecture is a shared fiber access technology (point-to-multipoint, 1:64). This network uses passive splitters in the distribution network to serve 64 homes (or small businesses) for every fibre from a central distribution point. This means 2.5 Gbps capacity

per fibre could be shared by as many as 64 homes. It is not possible to offer leased lines, with 100% of guarantee bandwidth, based on this network.

3.14.3 Leased lines are based on point-to-point access technology that is deployed on demand in parallel to GPON network.

3.15 Regulators continue to find these markets are separate and require different regulation:

Country	Leased Lines form a separate market to broadband	Mobile backhaul market distinct from leased lines
Spain	Yes 2016 decision	Yes 2016 decision
Portugal	Yes 2014 decision	

3.16 Regulators in other countries recognise that FTTx and leased lines networks are distinct and that FTTx and Leased Lines regulation needs to be addressed via properly tailored regulatory remedies. The evidence shows that the types of services that are sold by a network owner depends significantly on the heritage of that network and the services that were sold prior to the new FTTx build. For example cable infrastructure owners have upgrade the cable to become gigabit capable. New entrants to the market have built networks to provide just FTTx services and focus their business on that key activity.

4 Responses to questions

Question 2.1 What are your views on our general approach to regulation and geographic market differentiation in this review?

Standard market analysis approach

4.1 The EU SMP guidelines set out the expected approach to determining the need for regulation. This is achieved using thorough economic assessment of the competition conditions of a product market:

4.1.1 The starting point is the analysis to determine which products/services are relevant to each market;

4.1.2 A second step then considers whether the product markets found have any geographic variations, with differing levels of competition experienced by users of those products across the geographies considered;

4.1.3 The analysis then takes a forward look at the expected situation for the period of the review, when the remedies would be in force.

4.2 We recognise that this consultation is not the full market review analysis, instead it is a narrower precursor consideration of how Ofcom might account for the expected changes in the geographic availability of (FTTP) networks over the review period. It is particularly challenging given the uncertainties of investment from Communication Providers in the period. Taking into account that the regulatory review period will last a full five years, and will not commence for a further two years (spanning 2021 to 2026), this consultation is far longer and more distant than previous market reviews.

4.3 We find it very difficult to engage in the geographic discussion at this point without step 1 above being conducted. It is necessary to first determine the product market – and in particular, to determine which networks support the provision of which services – before deciding whether each network (due to its particular assets) is capable of forming a relevant substitute to another network (with similar or different assets) for the period of the review, or even longer term. We do not accept that every network is capable of supporting products across the WLA and BCM spectrum. This is because of technical limitations and the respective strategies of the various network owners. This means it cannot simply be assumed that networks are service agnostic and that they, by default, are economic substitutes.

Networks have been built to serve customer segments

4.4 The networks present in the UK or those planned to be built have been built to focus on particular market segments and a particular type of service provision. The detail of their configuration has been to meet the demand of the 1) location of the customers and 2) the service that was/is intended to be provided. This means that the telecoms networks' ducts contain different types of fibre or cable depending on the product market the network owner seeks to serve.

4.5 For example, the BT network predominately has copper to residential properties and small site business locations to provide telephony and broadband. These services are available from all ~5600 BT exchanges, which cover the UK. However, BT business connectivity leased lines are available from less than ~2000 BT exchanges, as BT do not have leased lines handling capability at the other ~3600 exchanges.

4.6 Similarly, the Virgin network is made up of the former cable franchises that were set up in the 1980s to deliver cable TV to residential customers. The vast majority of the Virgin network therefore contains coaxial cable between the customer premise and the Virgin cabinet. The cabinets aggregating the coaxial lines from residential premises are connected with fibre. Fibre is used to bring the connectivity back to the Virgin core. However, the fibre needed between the cabinet and the core was installed for a network intended to offer distributed cable TV and therefore will contain very small fibre bundles. It is therefore a substantial undertaking to add additional cables to provide dedicated leased lines in any volume.

4.7 As Ofcom's own Passive Infrastructure market review consultation highlighted, there may be locations where ducting has not been used, particular in the context of drop wires, limiting the ability to retrofit fibre to these premises without a significant and costly engineering project.

4.8 When Virgin sought to diversify its product mix to offer a range of business services beyond residential cable TV and telephony, the company built fibre specifically to provide leased lines connectivity. ✂

4.9 It is very clear that Virgin's network is distinctly oriented to customer segments. The legacy coaxial network cannot be reused to provide leased lines or provide spare fibre capacity for leased lines to feed off from in volumes necessary to make it a functioning substitute for leased lines service provision.

4.10 Where networks have been originally designed to meet the demand of leased lines customers, they are more adaptable to transitioning into serving FTTP premises, as leased lines networks are fibre rich and are more likely to contain cables with high fibre volumes. Although these networks will be

found in business areas rather than residential areas. Where residential and business customers overlap the leased lines network some of the high volume of fibres can be taken off either to serve local GPONs or to serve dedicated leased lines. We can see this in the situation of ✂ whose incarnation began as a number of separate leased lines serving networks.

New build will not necessarily support multiple service types

4.11 It is the business strategy of the network builder at the time of network build that dictates the capability of the network and desire of the network owner to serve multiple user types.

4.12 We see this situation in other European countries where we operate. These markets are further advanced in their FTTP roll out and provide a useful reference point around how network deployment can be expected to play out.

4.13 In Spain and Portugal, it is clear that there is network differentiation – FTTP networks are used to provide broadband services and leased lines networks are used to provide leased lines.

4.14 Spain and Portugal have had FTTP networks in situ for 6 to 7 years, yet their regulator continues to find distinct product markets for Market 3a (the UK WLA) and Market 4 (the UK BCM). We consider this to be the case due to the very different requirements needed to serve each of these markets.

4.15 In Wholesale Local Access, each premise is effectively a market of its own and can be served without impact or relationship to any other premise. In Business Connectivity, the demand profile requires a competitor at the retail level to be able to supply all sites relevant to the customer throughout the UK. Similarly, at the wholesale level, in order for the retailer to remain competitive enough to compete at the retail level, its wholesale suppliers need a level of scale and cost advantage for the additional supplier management costs to be absorbed.

Summary

4.16 This overview finds that networks are simply not generic. Without significant change and cost, networks are not capable of supplying product across markets. Each network competitor has evolved in a unique manner, and consequently, has network specific limitations around how it can serve customers:

4.17 Virgin can provide broadband across its cable network. But this is up to the bandwidth speed limit of the coaxial cable, and not up to the 1Gbit/s speeds offered by new FTTP deployment, at least not without a significant network upgrade to a new version of DOCSIS (3.1) and investment in the fibre access and backhaul network is needed to support these speeds. New consumer deployment by Virgin to expand its geographic reach is being installed as coaxial with some fibre also used in

places. As a result, only a limited proportion of the Virgin network is capable of 1Gbit/s connectivity, with leased lines deployment limited to a subset of postcodes.

4.18 Leased lines networks are naturally focused around the locations that businesses cluster. Alternative providers can reach varying subsets of postcodes with their full onnet connectivity. The goal of extending competitive reach has been more readily achieved by CPs aggregating local connectivity at the BT exchange using EAD LA and focusing investment from the exchange backward to their core networks.

4.19 In our response to the BCMR, we discussed the cost challenges of matching and beating Openreach fibre pricing in the business connectivity market. Currently, BT has a 60% retail market share of business connectivity. In order to win customers away from BT, a competitor needs to have either a materially lower priced service proposition or a service/quality enhancement that BT cannot replicate, which in both cases is enough to persuade the customer to switch away from the underlying Openreach access network. ✂

Question 2.1 What are your views on our approach to the geographic unit for our analysis?

4.20 When analysing the geographic unit to be used as the basis for the 2021 – 2026 review, we consider it necessary to undertake separate analysis for the WLA and BC markets for the reasons we identify in our answer to question one above.

4.21 A balance must be struck between identifying a meaningful geographic unit that is useful for administrative purposes, and recognising that within that unit, some premises may not benefit from the same level of connectivity as their neighbours due to a variety of often localised factors.

4.22 In the Wholesale Local Access market, where mass market consumer roll outs help the economics of network roll out, then a post code sector based analysis may be sufficient. However, it needs to ensure that there are minimal exceptions with the area, or it risks leaving too many consumers without an appropriate remedy. In contrast, business connectivity networks are very much focused on individual customer demand to connect a number of geographically spread sites, having substantial connection costs and connection lead times which create different and substantial competition barriers. The BC market has been shown to be national is scope as part of the BCMR consultation process.

BCM geographic analysis

4.23 To serve the UK enterprise market a supplier needs UK site coverage, as each enterprise has a requirement to connect a number of sites across a variety of postcodes. Our data shows that between 2017 and 2019, our customers needed to connect an average of ✂ sites in different

postcodes. Site demand ranges from a few sites to several thousand when supplying a high street organisation such as a supermarket, bank, or even a betting shop. A supplier to this retail market therefore needs to have access to a source(s) of end customer connectivity across the entirety of the UK to be a viable option in supplying these customers. Business connectivity is not purchased on a localised basis, and therefore the business connectivity market is not geographic and cannot be segmented as such. Retail customers are not offered pricing that is geographically variable. Retail customers are offered a total contract price, covering multiple sites. Wholesale providers do not offer geographic variations in price, instead, providers have a geographic agnostic pricing scheme which is offered universally throughout the geographies that they are able to serve.

4.24 Wholesale providers are typically restricted to competing for connectivity to individual sites in the event that they have network in situ or economically in reach when a retail customers' contract at that site is being renewed and has been won by a rival, requiring a wholesale input to serve the site. Wholesale competition is limited to this specific market role. In our estimation, using Ofcom's research data on switching and accounting for BT's retail market demand, which is only available to Openreach to supply, we find that alternative wholesalers are restricted to competing for limited connections.

4.25 Ofcom's BDRC research for the 2016 BCMR found that only 1/3 of users switched in the last 5 years. ✂ The volume is particularly limited as BT only buys from Openreach. This will not provide a radical change for circuit competition.

WLA geographic analysis

4.26 When looking at the geographic analysis for broadband provision it is necessary to first consider the product market and whether the array of broadband services available act as substitutes for one another.

4.27 Given the declining usefulness and popularity of standard broadband services predicted after 2021 (with Ofcom predicting 70%+ of supply will move to higher speed alternatives), it would be prudent to discount this option (BT and LLU variants) from the analysis. Indeed, it is not clear if a price regulated MPF product will exist post 2021. With LLU only available as a result of regulated remedies and Ofcom's focus on primary access, this would only leave BT's standard broadband offerings to consider.

4.28 The overwhelming majority of consumers by 2021 will derive their home broadband services from either BT (FTTC and G.Fast GEA and full fibre), Virgin Media or a self-build fibre broadband providers and their retailers.

4.29 BT has the following range of products:

- ADSL generation broadband is available at speeds 10Mbit/s to 96% of UK premises, with another ~3% of premises achieving speeds of less that 10Mbit/s.
- In the Wholesale Broadband Market Review (WBA) Ofcom concluded that there was competitive retail supply (taking account of Cable and Openreach LLU and GEA in 98% of premises (classified as Market B). In Market A, BT standard broadband service is the only option available to consumers in around 1% of UK premises (around 860,000 UK premises still cannot get broadband with a download speed of at least 10Mbit/s and an upload speed of at least 1Mbit/s, which is the specification for the UK Government's broadband Universal Service Obligation (USO). The remaining UK premises (just under 1%) accounted for by Hull (which now has widespread FTTP deployment as a result of investment by the incumbent).
- 91% of premises can access superfast broadband services (i.e. services offering download speeds of at least 30mbit/s).
- BT's G.fast service, with a speed capability topping out at 330Mbps aims to cover 5.7 million UK homes and businesses by the end of 2020 (March 2021 financial year).

4.30 Openreach's FTTP is expected to over 3 million premises by the end of 2020 and BT have indicated that it could then reach 10 million by around 2025 (no overbuild is over G.fast is planned) and progression to 10 million premises is not guaranteed.

4.31 Virgin has the following range of products:

- ~5.2M active connections with speeds of up to 350Mbit/s available for residential users and higher speeds for enterprise customers;
- Virgin's Project Lightning network expansion began in 2015/16 and has added 300,000 customers as a result. The original aim was to cover 4 million extra premises (17 million total or c.60% of UK premises) by the end of 2019 or 2020, but there has been speculation that the ambition will be reset to around 3 million premises (16 million in total, or c.57% of UK premises)
- The bulk of the Project Lighting expansion is additional coaxial deployment, with FTTP planned for the remainder.

4.32 New FTTP network providers with progressed coverage plans include:

- FTTP CityFibre with speed capability of up to 1Gbit/s has announced plans to cover 5M UK homes (~17% of UK premises). Vodafone is the primary retailer of services on the CityFibre network, offering services up to 900Mbp/s[4].
- Hyperoptic aims to cover 2 million UK premises at 1Gbps capable FTTP by the end of 2022.

4.33 Community Fibre – Social housing provider in London and other large cities with an aspiration of covering more than 1 million UK premises with FTTP by 2025

4.34 A product market definition exercise to group products into suitable substitute groupings would likely do this using download and upload bandwidth as a differentiator. There would be analysis required to see if standard broadband was acting as a substitute for lower speed FTTC GEA and cable (up to ~50Mbit/s) and then an intermediate market for speeds below G.Fast levels and then one or two bandwidth categories beyond this. It is only when it is found that a single product market exists that it is relevant to consider the geographic markets that might exist in relation to it.

4.35 This work will be further complicated by BT's program of WLR withdrawal and copper switch off. As the services available in different geographies is expected to evolve in the period 2021 – 2026. Copper Switch off will only take place once an alternative is made available (fibre in most cases, but potentially a wireless solution in more remote locations).

4.36 Copper switch off will continue well beyond the period of this market review, with a great deal of uncertainty around its pace and progress in the period considered by Ofcom

4.37 A second equally important consideration relates to the status of the Virgin network. With services for the bulk of its customers capped at 350Mbit/s due to technical restraints, there are questions around whether this speed is sufficient to satisfy consumer demand for the period up until 2026. If it is not, then cable networks should not be considered an ultra-fast broadband option unless further investment to secure Gigabit speeds over legacy cable is made.

4.38 It was our understanding that the objective Ofcom's strategic policy was seeking to achieve was the building of full fibre broadband networks, that being the title of Ofcom's strategic policy update of July 2018. Ofcom describes full fibre at 1.3:

[4] https://www.vodafone.co.uk/broadband/gigafast

"A number of full fibre operators have attracted new investors in recent months, including from institutions focused on infrastructure investment. A number of communications providers now have plans for significant ultrafast investments:

- *Virgin Media's Project Lightning continues, aiming to expand its network to an additional four million premises by 2020 of which two million will be full fibre*
- *Cityfibre and Vodafone have partnered to deliver full fibre to one million homes by 2020 with possible further expansion later;*
- *Hyperoptic has an ambition to pass two million homes and businesses by 2022*[5]
- *TalkTalk in partnership with Infracapital, has an ambition to reach three million homes with full fibre in the medium term; and*
- *Openreach has announced a plan to rollout full fibre to three million homes by 2020 and aims to reach 10 million homes by 2025*[6]*."*

4.39 From this explanation of the network build that is relevant to Ofcom strategic policy, it is clear that Ofcom seeks to encourage the building of full-fibre networks, which we would logically assume to be full-fibre all the way to the customer premises. The Government's DCMS FTIR explains that full-fibre means a gigabit capable network[7] as captured in the Ministerial foreword:

"The Government's ambition for digital connectivity do not stop here. We want to provide world-class digital connectivity that is gigabit-capable, reliable, long-lasting and widely available across the UK – and to do so at pace."

4.40 A geographic analysis, which sets out to identify where these full-fibre networks can be built on a competitive basis needs to evaluate exactly that – the building of full-fibre gigabit networks. It is plain that the prospects of network build and competing overlay network build is uncertain.

---

[5] This now having been set as an ambition to reach 5m homes by 2024 at per Hyperoptic press announcement 7th Nov 2018

[66] This now pending the securing of finances

[7] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/732496/Future_Telecoms_Infrastructure_Review.pdf

Partnerships are uncertain. Costs are uncertain. The Openreach duct and pole remedy continues to have operational issues.

4.41 In all likelihood, the duct and pole product will require substantial ongoing changes and development over the coming years to make it fully fit for purpose. This is not good news when roll out cost success is critical to network builders to obtaining future funding. There is a difference of opinion with regard to the proportion of the network build that can be substituted by duct and pole and the consequential network build cost savings.

4.42 It is apparent that the construction industry essential to the deployment of the networks is now stretched. There are production capacity limits for labour and materials, leading contractors to increase their charges for services across network build/extension works. The current UK Brexit issues, along with a substantial increase in demand from many companies across different UK towns, means there is an unprecedented demand on labour and materials. Overbuild exacerbates the problem.

4.43 It is evident that plans are likely to alter. Fibre builders understandably will prefer to build where they have first mover advantage. BT's incumbency advantages and ability to switch off copper and divert its own retail and wholesale supply base to the new fibre network gives it a considerable advantage, allowing it to profitably deploy fibre second or even third to preserve national ubiquity.

4.44 All these factors mean plans will evolve continuously around the actions taken by other building parties. A lack of contractor resource in geographic areas will be influential ✂. It is likely that areas which are found to have poor duct facilities, with a lack of capacity, will deter building as network builders seek alternative locations with better infrastructure.

4.45 As the improved duct and pole product is used, and as time progresses during 2020, Ofcom must update its analysis with network builders' updated business plans for the market review period.

Summary

4.46 Postcode sectors can be used to identify areas of full-fibre broadband network build. This would evaluate the build out plans of new gigabit capable full-fibre networks and would exclude networks that are not planned or capable of providing gigabit bandwidth capacity.

4.47 We agree with Ofcom that as it stands there will be no areas in the UK that can be designated as competitively providing full-fibre gigabit capable broadband services (3 or more networks in existence).

4.48 Looking to the longer term emerging evidence suggests that competing full-fibre gigabit network overbuild will be more limited with circa ✂ of the UK potentially having multiple network options. Consequently, the prospectively competitive segment of the UK is far more limited than Ofcom proposes with its 69%. As we discuss, this is an evolving situation which will become clearer as build experience increases over the coming 18 month period. Ofcom should reflect the latest facts nearer to the point of market review conclusion.

Question 3.2 What are your views on our approach to the threshold for considering a network to be present within a geographic unit?

Question 3.3 What are your views on our approach to analyzing existing, planned and potential future network rollout?

Question 3.3 What are your views on our approach to analysing existing, planned and potential future network rollout?

4.49 Ofcom's consultation highlights three significant elements to their analysis of network rollout and their potential future approach to determining competitive areas, potentially competitive areas and non-competitive areas. Ofcom's three elements of analysis are:

- The way they consider rolled out network, planned rolled out network, and potentially rolled out network
- The way areas are grouped, for example postcode sectors
- The threshold Ofcom use for considering a network is present in the areas as defined above.

The consideration of rolled out, planned roll out, and potential roll out of network

4.50 In Ofcom's illustrative assessment there are currently no areas where competition is currently effective,[8] therefore any assessment is starting from a zero base with no actual proven area of the country where competitive network build provides an adequate constraint on BT SMP.

4.51 Ofcom speculate in their illustrative assessment that 69% of the country could be categorised as areas where competitive network build could provide an adequate constraint on BT's SMP. In the government's FTIR review[9] Frontier economics provided some modelling on the potential cost of

[8] Ofcom's consultation paragraph 4.3

[9] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/732496/Future_Telecoms_Infrastructure_Review.pdf

full fibre rollout in the UK using a number of scenarios. All projections for significate fibre rollout required investment sums in excess of £30billion.

4.52 The UK is starting from a place of zero areas being currently 'network competitive' and a colossal hurdle of £30 billion of investment required to enable a significant part of the country to be 'network competitive'. Therefore, Ofcom must put in place a rigorous framework to enable continuous monitoring of geographic progress and forecast progress considering the dynamically changing investment environment. If the UK did attract the scale of investment required in a reasonable timeframe (i.e. 5 to 10 years) it would be one of the biggest ever achievements for an infrastructure-based industry in the UK.

4.53 Ofcom's consultation suggests a potential method to determine what areas of the country are competitive, potentially competitive, and never to be competitive, terming them category 1, category 2 and category 3 respectively. Ofcom's illustrative analysis currently groups no areas in category (1), ~70% of the country in category (2), and ~30% of the country into category (3). Clearly, Ofcom presently consider that category (2) will be the largest grouping of areas of the UK, and that over time most of the areas in category (2) will fall into category (1). However, would Ofcom's approach to regulation be different if this were not to be the case? What would Ofcom's approach to regulation be if they had, a robust framework in place that indicated this were not lightly to be the case? For example in late 2020 if Ofcom had updated modelling and actual assumptions that could feed into a framework model that indicated in fact the majority of category (2) was more likely to fall into category (3) and that category (1) was only ever going to amount at the most to 30% of the country.

4.54 Of course, any discussion regarding the future is pure speculation, the fibre investment market in the UK is a dynamically changing and a highly sensitive market fueled by investment banks and a cash constrained incumbent operator that has only defensively announced fibre rollout plans. Vodafone urge Ofcom to put in place a robust economic framework model that is dynamic and continuously monitors investor's actuals, roll out costing assumptions, and resultant consumer service take-up. There is a wide range of factors that are constantly changing the economics of fibre network rollout in the UK, and Ofcom need to continuously monitor these to assess how these relate to the percentage of the country that will end up in their categories (1), (2) and (3). For example, the economics of rolling out fibre in an area where Openreach has or has announced it will roll out fibre are instantly changed. Likewise, the reduction in costs that fibre network builders are able to achieve by using BT's regulated duct and pole product will influence their rollout plans.

4.55 A dynamic network build model could consider all of the facts that effect an operator's likelihood of rolling out fibre network and enable Ofcom to have an up to date view of the potential future network fibre competitive landscape. ✂

Geographical grouping of area's

4.56 Ofcom is seeking to differentiate between geographic areas based on the competitive conditions within those areas; therefore, it is necessary to break the UK down into smaller areas. The smallest possible breakdown is to separate each premise, the largest possible breakdown is to group the UK together as one area. Clearly neither of these options is viable and Ofcom need to find a compromise in-between that is not too detailed so as to be unmanageable, but it small enough so that each area has similar competitive characteristics within it. The option that best suits this compromise will be determine by the dynamic regulatory modelling framework that Ofcom imposes around this market assessment.

Threshold for network presents

4.57 Once the UK is grouped into smaller areas that can be individually assessed for their competitive conditions, Ofcom has to decide the number of operators that are required to provide a competitive constraint and the coverage within that area that an operator needs in order to be considered as being present. Ofcom throughout their document have indicated that only when three 'competing' networks are present will an area be considered as competitive. Vodafone consider that this is a valid starting point provided all three networks are truly full fibre networks. Any fewer networks in an area would certainly not indicate a competitive area, but Ofcom must monitor pricing and market conditions as areas emerge to ensure that their hypotheses is played out in the market.

4.58 In considering the coverage within an area that a fibre network operator needs before it is determined as present, Ofcom should consider a simple layperson approach rather than relying on an inappropriate historic approach. Ofcom cite the 2008 WBA statement as historic evidence that a judgement number of 65% is appropriate. Indeed if Ofcom were implementing an approach similar to that of the WBA review in 2008, it may well be correct. In the 2008 WBA review Ofcom viewed that a BT exchange was competitive if two LLU operators were present and Virgin Media's network covered 65% of the area. Considering LLU operators had 100% coverage of the BT exchange area, Ofcom basically concluded in the 2008 WBA review that an area was competitive if two operators had 100% coverage and one operator had 65% coverage. Vodafone would not support this conclusion in the context of fibre network competition. The 2018 WBA and BC market reviews merely copied this approach without any further analysis and thus are not valid points of evidence.

4.59 Vodafone considers that an assumption of 65% is only correct in that it lays between 0% and 100%, Ofcom need to carry out research or European benchmarking to determine the extent of network required in an area to provide a competitive constraint. Absent this, Ofcom should consider a more layperson approach. If a network operator is present in 100% of the area clearly they can be counted, if they are present in slightly less than 100% of the area then they are slightly less likely to provide a competitive constraint. If they are present in 50% of the area then they are as likely or not to be able to provide a competitive constraint. A responsible regulator should opt for an outcome that is clearly more likely than not, but also conservative, therefore a far more reasonable layperson's assumption (absent better data) would be 90%.

Question 4.1 What are your views on the illustrate assessment of our approach?

4.60 Ofcom have provided an illustrative assessment of competitive intensity in different geographic areas of the UK based on the approach set out in their consultation document. Ofcom explain that the purpose of this assessment is to enable stakeholders to better understand and engage with our proposed approach. Ofcom also note that the output of this assessment should not be taken to be a definitive view on the appropriate geographic areas.

4.61 Vodafone considers that Ofcom has provided an interesting illustrative assessment of the prospects for competition across the UK, and this assessment indicates the extent of Ofcom's desires regarding the geographic scope of competitive network fibre infrastructure across the UK. However this illustrative example is not based on an economic framework or an analytical network model, it is purely based on Ofcom's antidotal evidence and general desires for competition across the UK.

4.62 As discussed previously, the extent of areas with competitive fibre networks is currently zero. As mentioned previously, what stands between the present situation and Ofcom's illustrative example resembling reality is in excess of £30bn of investment. Ofcom should invest time and focus on establishing a robust economic framework network model that will continuously assess the economic viability of network investment across the UK and not simply rely on antidotal 'causal' evidence.