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The competitive impact of duct and pole access on the BCMR 2019

Report prepared for British Telecommunications plc

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Redacted Openreach and BT confidential information is denoted by [✂].

Executive Summary

Introduction

1 On 2 November 2018 Ofcom published a consultation on the Business Connectivity Market Review ('BCMR') for the period April 2019 to March 2021 ('BCMR 2019'). The BCMR concerns the wholesale markets for business connectivity services which are used by to provide high capacity services to businesses, mobile network operators and communications providers ('CPs').

2 This report considers the appropriate approach to market analysis and remedy design in the BCMR 2019. In particular, it sets out why Ofcom has erred in its analysis, by taking little or no account of the market changes that appear likely to occur during the review period due to improved access to BT's duct and pole network ('DPA'). This omission undermines the robustness of Ofcom's findings of significant market power ('SMP'), which calls into question the appropriateness of the remedies it proposes.

Background

3 Following the conclusion of the Digital Communications Review, Ofcom is implementing a strategic shift to encourage investment in new ultrafast fibre networks. Ofcom has stated that it intends to achieve this strategic shift by improving access to BT's network of ducts and poles to allow rival CPs to connect their own fibre optic cables directly to homes and businesses at a lower up-front cost.[1]

4 Accordingly, Ofcom required Openreach to make several improvements to its regulated Physical Infrastructure Access ('PIA') product in the Wholesale Local Access Market Review ('WLAMR') 2018. A key element of these changes was the relaxation of existing usage restrictions to allow it to be used for 'mixed usage' purposes. Under 'mixed usage' DPA ('MUDPA') CPs can deploy fibre to provide leased line services provided that the primary use of DPA is to provide consumer broadband services. While elements of the MUDPA changes have already been put in place by Openreach, MUDPA is expected to be fully implemented by April 2019.

5 On 2 November 2018 Ofcom published a consultation on the Physical Infrastructure Market Review ('PIMR') covering the same period as the BCMR 2019. Ofcom proposes in the PIMR to mandate that BT provides unrestricted nationwide DPA ('UDPA'). Based on Ofcom's current proposals, UDPA will be similar to MUDPA with the key difference being that CPs can use UDPA without any restriction on whether they provide broadband or non-broadband services. Ofcom proposes that UDPA will be available a month following the PIMR Statement and will therefore be available for the vast majority of the BCMR 2019 review period.[2]

6 UDPA is a key element of both the UK government and Ofcom's strategy. In its July 2018 Strategic Policy Position, paragraph 1.16, Ofcom stated:

> *"We plan to introduce proposals that seek to provide unrestricted access to Openreach's ducts and poles nationwide. An unrestricted remedy would provide greater flexibility, better reflecting the needs of operators investing in full-fibre networks to provide a range of*

[1] Ofcom 2016 *Making Communications Work for Everyone*, para. 1.23.

[2] If Ofcom decides not to require BT to provide UDPA CPs would still be able to use the MUDPA remedy throughout the review period.

services; for example, initially leased lines to businesses, and later broadband to homes." (Emphasis added)

7 The BCMR 2019 requires a forward-looking assessment of whether competition will be effective in the relevant markets during the review period considering expected or foreseeable market developments. Ofcom can only impose remedies on operators that it identifies as having SMP in those markets, which implies that there would be insufficient competitive constraints on the SMP operator(s), absent intervention.

8 Ofcom's analysis of competitive constraints in the BCMR 2019 focuses on the ability of rival CPs to use their own network infrastructure to contest contracts for business connectivity services. However, the competitive impact of DPA is not considered by Ofcom in its market definition analysis, and only to a limited extent in its SMP assessment.

9 Ofcom recognises that regulated access to BT's physical infrastructure, including DPA, will allow competition to emerge more strongly in broadband and business connectivity markets downstream of physical infrastructure.[3] However, Ofcom appears to consider that CPs' usage of DPA will be limited during the BCMR 2019 review period, and therefore will be insufficient to result in effective competition by 2021. Ofcom does not, however, set out any detailed evidence to support this view.

Taking appropriate account of DPA would likely lead to material changes in Ofcom's conclusions on market analysis

10 We consider that DPA is likely to have a material impact on competition in business connectivity markets in the BCMR 2019 review period in many areas. CPs can take advantage of the improvements in BT's current PIA product mandated in the WLAMR 2018 already for mixed usage deployments[4], and the proposed UDPA remedy will become available shortly after the BCMR Statement in spring this year. This increases CPs' ability and incentive to deploy fibre, including in business connectivity markets only, resulting in a material increase in the competitive constraints on BT as a result.

11 Ofcom has not fully taken DPA into account and consequently its analysis of the wholesale business connectivity markets is not robust. Ofcom's current approach risks imposing regulatory remedies inappropriately in areas where effective competition either exists now or is likely to emerge during the review period.

CPs will be able to use DPA to provide leased lines from the start of the BCMR 2019 review period

12 CPs will be able to take advantage of improvements in BT's DPA product (in particular the relaxation of usage requirements allowing leased lines to be targeted) from the start of the BCMR 2019 review period.

- **Ofcom addressed the main historical limitations of BT's DPA product in the WLAMR 2018.** Ofcom directed BT to make extensive changes to improve its PIA product through the

[3] For example, see PIMR, para. 1.12.

[4] i.e. the deployment of local access networks offering both broadband and non-broadband services, provided the primary purpose of the network deployment is the delivery of broadband services.

introduction of MUDPA in WLAMR 2018. Ofcom has had a key role ensuring these changes are implemented including via hosting the Duct and Pole Implementation Progress Meetings which are chaired by Ofcom's CEO.

- **The proposed UDPA remedy is essentially the same product as MUDPA** but without usage restrictions thereby allowing business customers to be targeted solely, without the need to demonstrate an intent to deploy consumer broadband. Accordingly, UDPA will be a familiar product to CPs which they can use from launch.

- **UDPA will be available for the vast majority of the BCMR review period**. Assuming Ofcom proceeds with its proposals, and UDPA is based on MUDPA, it will be ready to use as soon as it is introduced. As set out above, under Ofcom's current proposals, UDPA will be available a month following the PIMR Statement and will therefore be available for the vast majority of the BCMR 2019 review period.

- **Many CPs have already gone through Openreach's process to enable them to use UDPA at launch.** At December 2018, [✂] have been established to use BT's DPA products meaning they can place live orders. A further [✂] CPs ([✂]) are in the process of becoming 'established'.

DPA increases CPs' ability and incentive to deploy their own fibre

13 The improvements to DPA made in the WLAMR 2018, and the proposed introduction of UDPA, will allow CPs to deploy their own fibre more cheaply, rapidly and in more locations than using only their own physical infrastructure, resulting in effective competition in many more situations:

- **DPA enables CPs to deploy their own fibre more rapidly.** Deployment of own fibre using DPA reduces the need for time-consuming civils works.[5] Furthermore, CPs can determine deployment speed (absent the need for network adjustments), since Openreach has little involvement in provisioning duct access.

- **DPA allows CPs to better control the customer experience.** CPs using DPA are not reliant on Openreach to provision equipment to their customers or for making the physical infrastructure connections to their premises.

- **DPA significantly reduces own-fibre deployment costs.** DPA allows CPs to deploy fibre at lower cost by reducing the need to invest in civil infrastructure. The cost reduction will be larger where CPs use DPA to aggregate demand in a specific area (e.g. serving adjacent business premises themselves or aggregating demand from several CPs).

- **DPA significantly reduces the risks of own-fibre deployment.** If CPs invest in their own physical infrastructure assets, such as duct, this involves large, sunk investments in long-lived assets. The economic life of these assets is well beyond the typical minimum contract term for retail leased lines of up to 5 years. Investing in own build duct for specific leased lines

[5] DPA involves less extensive survey and planning work, requires less extensive wayleaves and other permissions (e.g. road closures), and avoids the time-consuming construction work to create and install the necessary civil infrastructure.

customers can therefore raise risks of stranded assets for CPs. DPA significantly reduces such stranded asset risks.

- **DPA allows CPs to extend their networks, reducing the costs for serving future customers.** Using DPA instead of purchasing Openreach wholesale Ethernet circuits allows CPs to extend their networks, which reduces the costs of connecting new customers in future. We expect CPs to pursue such opportunities to develop their networks as soon as they can within the BCMR 2019 review period. CPs will face a particularly strong incentive to use DPA to self-provide higher value circuits, such as very-high bandwidth ('VHB') circuits (either as part of a mixed-usage deployment, or on an individual circuit basis using UDPA).[6]

This is likely to increase the competitive constraints on BT in many areas

14 The availability of DPA will mean that it is profitable for CPs to serve business connectivity end-users that are located much further from their existing network (as illustrated in Figure 1 below). This will reduce CPs' reliance on Openreach's wholesale Ethernet services and constrain Openreach's ability to set the terms for its wholesale business connectivity products independently of rivals in many geographic areas.

- **DPA enables CPs to provide their own fibre connections to end users at lower cost** than the cheapest Openreach wholesale Ethernet services (100Mbit/s EAD LA services) for distances up to around 300m even taking just a three-year payback period. For higher bandwidth services DPA is lower cost than the Openreach wholesale Ethernet service for even greater distances. For example, for 10Gbit/s EAD LA services it would be cheaper to use DPA to provide own-fibre connections for distances over a kilometre.[7]

- **DPA allows CPs to economically address demand located 10 times further away from their existing networks than own-build network extensions.** Our analysis of Ofcom's economic dig distance model implies that the cost to CPs of using their own physical infrastructure (e.g. their own duct) is at least 50% of the total costs of self-providing leased lines. DPA therefore allows CPs to avoid a significant proportion of own-build costs. Our analysis shows that CPs can address demand 10 times further away from their existing network with their own fibre using DPA.

- **The impact of DPA will be even greater where it is used to provide multiple circuits.** This is likely in three separate types of deployment. First, CPs can use DPA to aggregate multiple business connectivity circuits in an area (e.g. use DPA to run a single cable with multiple fibres into a business park to connect several customers). Second, firms[8] can aggregate demand from multiple CPs and use DPA to improve the economics of own network build. Third, CPs can already use DPA strategically as part of a wider, multi-service FTTP deployment to a broader region or area that exploits the economies of density and scope that arise using DPA.

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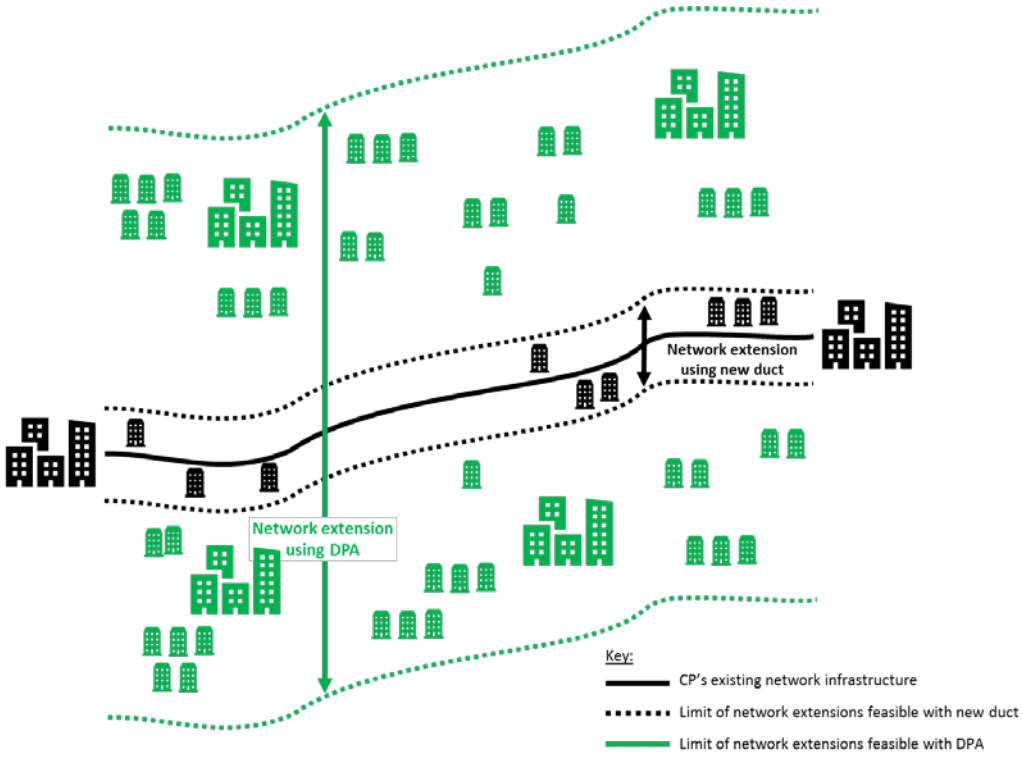
6 As the charges for Openreach's wholesale Ethernet services that are avoided by self-building are higher.

7 This is based on our analysis of Ofcom's economic dig distance model, released alongside the BCMR 2019 consultation which we have adjusted to incorporate DPA. Our adjustments to Ofcom's model are explained in Annex A1. As we have adopted a conservative approach to incorporating DPA into Ofcom's modelling, the economic deployment distances using DPA could be materially greater than we have set out here.

8 We understand that SSE Enterprise Telecoms is an example of such a firm.

Figure 1: Stylised illustration of the impact of DPA on CPs' ability to reach business sites



Source: AlixPartners

DPA has important implications for the analysis of the wholesale business connectivity markets in BCMR 2019

15 We expect the improvements in DPA and the proposed usage restriction removal to result in a material increase in competitive constraints on BT in the review period.

- **DPA will allow CPs to address many more business sites** that are located much further from their networks and do so more competitively than with own build (or using Openreach's wholesale Ethernet products).

- **DPA will increase the number of CPs capable of serving business sites within given areas,** including in the HNR Metro areas identified by Ofcom.

- **DPA will lead to a sustained reduction in the cost of rivals' network deployments that will increase the potential for competition** providing a competitive constraint on BT's prices, potentially in advance of actual competitive network deployment and before the emergence of observable changes in network presence in market shares. The competitive constraint can be expected to arise in two ways. First, DPA will increase the likelihood of CPs using DPA (in combination with their own or third-party fibre) rather than Openreach's wholesale Ethernet services (all else being equal). This increased threat of switching will directly constrain Openreach's Ethernet services. Second, Openreach will also face a constraint if it expects its Ethernet customers (i.e. CPs) to face greater retail competition from rivals bidding for contracts based on using lower cost DPA-based services. Neither of these

constraints rely on CPs currently using DPA, or in the case of indirect constraints, bidding being based on using DPA. Rather, they rely on Openreach considering the use of DPA by rival CPs to be sufficiently credible. Given that Ofcom plans to mandate DPA on a UK wide basis, including for business connectivity deployments only, competitive constraints from potential or likely network presence will affect BT's incentives in many areas (including the CLA).

Implications for Ofcom's market definition analysis

16 Ofcom's geographic market definition analysis is based on the costs of self-build and explicitly excludes any impact of DPA.

- **Using an appropriate buffer distance would likely result in many more postcode sectors being classified as 'high network reach' areas.** The sensitivity analysis undertaken by Ofcom[9] shows that increasing the buffer distance[10] from 50m to 100m, the number of postcode sectors classified as 'high network reach' ('HNR') more than doubles (i.e. from 576 to 1,261), and the number of postcode sectors categorised as 'BT Only' falls by over 20% (i.e. from 5,810 to 4,575). Our analysis suggests that a 100m buffer distance would still be highly conservative and a more appropriate assumption would be a minimum of 300m. Using a 300m buffer distance would likely result in many more postcode sectors being more appropriately reclassified from BT+1 or BT Only to being HNR areas.

- **For CI Inter-Exchange we would also expect a material increase in the number of exchanges which would have one or two CPs present in the review period.** DPA will also reduce the costs for CPs of establishing a presence at additional BT exchanges. Our analysis using Ofcom's economic dig-distance modelling shows that, with DPA, CPs will find it economic to deploy their own fibre over much longer distances for VHB connections.[11] For example, assuming a 7-year economic life[12] it would be more cost effective for CPs to use DPA than EAD LA 10Gbit/s for circuits up to c.1.6km.

17 It is difficult to quantify the precise impact of this on the CI Inter-Exchange market definition as Ofcom's quantitative analysis of the inter-exchange market is limited. In particular, Ofcom only provides information on measures of average distance between BT exchanges and the 1st and 2nd closest rivals. For 'BT Only' exchanges, the average distance to rivals is substantial – more than 6km. However, within these averages we would expect considerable variation for individual exchanges – for many exchanges the distances will be less than 6km. It is important to consider the potential for CPs to build out to an exchange on an individual exchange basis. This requires a disaggregated analysis, which Ofcom has not set out. It is likely that there will be some of the 'BT Only' exchanges for which DPA will enable multiple CPs to deploy their own fibre. This is

9 As set out in Table A13.1 of the BCMR 2019 consultation.

10 Buffer distance is the distance over which a CP can extend its network to serve a customer. We are unable to model the precise impact of a more appropriate buffer distance assumptions as we do not have access to Ofcom's information on CP network locations.

11 CPs typically require considerably higher bandwidth for exchange connectivity, therefore it is relevant to consider VHB circuits.

12 CPs are likely to consider longer time horizons for investments in improving exchange connectivity than customer-specific deployments since the payback on the investment is not specific to any one customer or service.

particularly likely where CPs have multiple VHB circuits connected to them or could do so over the review period.

Implications for Ofcom's assessment of SMP

18 Ofcom's SMP assessment in the CI Access market is largely predicated on BT's control of its duct and pole network. As explained above, DPA will allow BT's downstream rivals equivalent access to this network**,** therefore ensuring that the competitive advantages that BT has historically derived from this will be available to all CPs.[13] However, Ofcom considers that DPA will have no material impact on its SMP analysis for CI access services on the basis that usage will only be limited during the review period.

19 Our analysis suggests that Ofcom should reconsider its SMP findings taking into account the impact of DPA on CPs' ability and incentive to deploy their own networks within the review period. In our judgement, if it was to do so Ofcom would likely find materially more areas will tend towards being effectively competitive over the review period. Furthermore, Ofcom should place greater weight on the impact of DPA on actual and potential competition rather than historic market shares that do not reflect the competitive constraints on BT over the review period. This is particularly the case in HNR Metro and other HNR areas where CPs already have a material degree of network presence which is located closer to customer sites.

20 In the CI Inter-Exchange market our analysis of deployment distances using DPA indicates that CPs could profitably extend their network over longer distances than those considered by Ofcom based on self-build costs. Ofcom should assess the competitive impact of DPA on individual exchanges to assess the potential for network competition. This is likely to show that more BT-only and BT+1 exchanges are prospectively competitive over the review period and hence should not be found to have SMP.

Implications for remedies

21 Ex ante remedies should only be applied in markets where BT has SMP and the design of those remedies should be sensitive to the degree of market power. This is important to minimise the risk of deterring fibre investment by distorting CPs' incentives to deploy their own infrastructure. Given the overarching aim of Ofcom's strategy is to promote competitive investment in full-fibre networks, this calls for a conservative approach to remedies which errs on the side of caution and gives this investment and competition a chance to develop.[14]

22 While Ofcom does allow for some geographic variation in remedies, our analysis suggests that it has not appropriately assessed the potential competitive impact of DPA. This undermines the robustness of Ofcom's proposed market analysis findings, with the risk that the proposed regulatory remedies are incorrectly applied in areas where effective competition either exists now or is likely to emerge during the BCMR 2019 review period.

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13 We note that Ofcom proposes to impose a 'no undue discrimination' on BT that applies to all forms of network access provided by BT in each Physical Infrastructure market. See PIMR 2019, para. 4.22 to 4.41.

14 See Ofcom, 2018. *Regulatory certainty to support investment in full-fibre broadband*, para.4.15.

23 Where Ofcom has taken into account DPA and finds that BT has SMP, it is also important that it considers the increased actual and potential competition enabled by DPA when designing remedies. For example:

- **In HNR Metro areas (and beyond for VHB)**: Ofcom should consider removing the requirement to provide wholesale access in the CI access services market where there is sufficient actual and potential network competition based on DPA. Network investment based on DPA is likely to emerge more rapidly in the HNR Metro areas than elsewhere, since CPs already have material network presence and network deployment distances are typically relatively short.[15] Since DPA will allow CPs to deploy fibre profitably further from their existing networks it is likely to increase their ability to contest a greater proportion of business sites in HNR Metro areas. Moreover, by lowering the cost of network extensions DPA will increase the competitive constraint on BT; the greater threat of entry using DPA can be expected to intensify potential competition in advance of further network deployments. For these reasons, DPA is likely to have a particularly significant impact in the HNR Metro areas, with the result that competitive conditions will be more similar to the CLA. Similarly, given the higher value nature of VHB circuits, CPs can be expected to use DPA to deploy fibre profitability further from their existing network, including outside HNR Metro areas, for these circuits.

- **In other CI access markets:** as set out above, the availability of DPA may mean that for some areas network competition will materially increase during in the review period, but not to the point where Ofcom considers it to be sufficient to alter its SMP finding. In such areas, Ofcom should consider whether it is proportionate to apply more intrusive remedies (e.g. the proposed charge control, minimum quality of service remedies and equality of inputs obligations). The fact that volume or geographic discounts (unlike term discounts) do not count towards charge control compliance reduces Openreach's incentives to lower its wholesale Ethernet prices to win customers in those parts of the country where its costs are lower than average (and to charge more where costs are higher).[16] This restricts Openreach's ability to compete on price and also risks creating an inefficient misalignment of prices and costs distorting CPs' investment incentives. If these distortions result in a higher cost supplier providing services, this would result in higher industry costs. If these higher costs are passed on to customers by way of higher prices, this may lower the take-up of fibre services. Such outcomes are undesirable and would undermine the policy goal of promoting network competition, deregulation and the development of high speed fibre services in the UK.

- **In the CI inter-exchange market:** Ofcom should reconsider its proposal to require BT to provide dark fibre at BT-only exchanges in this review. Ofcom proposes that BT should be required to provide dark fibre only in areas where it is confident that network competition is unlikely to develop in the medium to long term.[17] We agree that it is appropriate to err on the side of caution in view of the risk that regulated dark fibre will undermine fibre investment. However, as noted above, Ofcom would need to consider the impact of DPA on competitive conditions at individual exchanges to fully understand the potential for investment by CPs. In

15 Ofcom's dig distance analysis shows that 80-90% of businesses in the Metro areas have at least two rival networks within 50m (see Table 6.6 of BCMR 2019). Furthermore, in the HNR areas outside the CLA, Ofcom finds that the average distance to the third rival is only 134m, while the for the fourth it is 387m (see Table 6.9).

16 See BCMR 2019 volume 2, para. 5.19.

17 BCMR 2019, para. 10.15.

the absence of such an analysis (and assuming it is possible to conclude with reasonable certainty the DPA would not be sufficiently used), it seems premature to require dark fibre at this stage given the risks to investment.[18]

[18] Without prejudice to the issues BT Group and Openreach raise in their responses to the PIMR and the BCMR challenging the proportionality of the dark fibre remedy.

1 Introduction

Background

24 Ofcom published the Business Connectivity Market Review ('BCMR 2019') consultation on 2 November 2018. This market review concerns the wholesale markets for business connectivity services which are used to provide high capacity services to large businesses, mobile network operators and communications providers. Ofcom is consulting on its regulatory proposals in the BCMR 2019 for the two-year period from April 2019 to March 2021 ('the review period').

25 Ofcom is also considering the related market for telecoms physical infrastructure (e.g. ducts and poles) used to supply fixed communications services in the Physical Infrastructure Market Review ('PIMR') 2019.[19] Ofcom proposes to find that BT has SMP in this market and to require it to provide unrestricted duct and pole access ('UDPA') throughout the UK within one month of the PIMR statement being published in spring 2019.

26 Regulated access to BT's network of ducts and poles is a key element of the UK government and Ofcom's strategy to promote investment in fibre-optic communications networks and increase the availability of high speed broadband and broadband services across the UK. Using DPA, rival communications providers ('CPs') can invest in their own fibre networks using BT's duct and pole network without investing in their own physical infrastructure. This will significantly increase the incentive to invest in fibre networks by lowering the cost and risk of fibre investment.

27 Ofcom required Openreach to make several improvements to its regulated DPA product in the WLAMR 2018. A key element of these changes was the relaxation of existing usage restrictions to allow it to be used for 'mixed usage' purposes. Under MUDPA CPs can deploy fibre to provide leased line services provided that the primary use of DPA is to provide consumer broadband services. While elements of the MUDPA changes have already been put in place by Openreach[20], MUDPA is expected to be fully implemented[21] by April 2019.

28 The proposed UDPA remedy will further increase the attractiveness of DPA by allowing CPs to use it to provide both non-broadband and broadband services without restriction. These changes will give CPs more flexibility in the use of DPA, enabling them to compete for a much larger proportion of wholesale leased lines than before.

29 The improvements to BT's existing DPA product required through MUDPA, and the proposed introduction of UDPA, have important implications for the BCMR 2019 since they are likely to impact on the competitive conditions in the downstream business connectivity markets in the review period. As noted, the improvements in BT's existing DPA product in the WLAMR 2018 will be available from April 2019, and Ofcom proposes that UDPA will be available from spring 2019 (i.e. one month following the publication of the PIMR Statement). This means that CPs will be able to use DPA to provide leased lines for the entire two-year period covered by the BCMR 2019.

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19 The BCMR 2019 is intended to ensure that the appropriate regulations are in place when the current SMP regulations expire in March 2019. The PIMR 2019 gives effect to Ofcom's aim to introduce UDPA as an SMP regulation. Both reviews have a two-year time period from April 2019 to March 2021. Ofcom intends to carry out a consolidated Single Access Market Review in 2021.

20 For example, changes to the pricing of Openreach's PIA product were made in May 2018.

21 For example, changes to how Openreach charges CPs for network adjustments and the publication of a new PIA reference offer will be made by April 2019.

Moreover, CPs will have a clear incentive to use DPA to take advantage of profitable opportunities to provide non-broadband and broadband services. This is likely to increase network competition in more areas, strengthening the competitive constraints on BT and eroding its market power in the business connectivity and other downstream markets.

30 Given this, it is important that Ofcom fully considers the competitive impact of DPA in the BCMR 2019 and assesses the implications for market definition, SMP analysis and remedies. However, DPA is not considered in Ofcom's market definition analysis, and only to a limited extent in its SMP assessment. This approach risks understating the competitive impact of DPA in the review period and consequent errors in Ofcom's market analysis which undermine its SMP findings and remedies.

Scope of this report

31 This report set out the reasons why DPA is likely to have a material competitive impact in the review period. It is structured as follows:

- **Section 2** explains the limited consideration given to the competitive impact of DPA in the BCMR 2019 consultation.
- **Section 3** explains how DPA will increase CPs' ability and incentive to deploy fibre in the review period.
- **Section 4** considers the implications of DPA for Ofcom's BCMR 2019 market analysis.

2 Ofcom's analysis of the competitive impact of DPA is limited

Introduction

32 Under the EU regulatory framework Ofcom can only impose ex ante regulations in the business connectivity market on operators that it identifies as having SMP in the relevant market(s) on the basis of a formal market review. The market review process requires a forward-looking assessment of competitive conditions in the wholesale market for business connectivity services that considers both existing market conditions and expected or foreseeable market developments over the review period.[22]

33 Since the purpose of the BCMR 2019 is to determine whether ex ante regulation is necessary, Ofcom's market analysis must consider whether competition is effective, or is likely to become effective over the review period, absent SMP regulation in the business connectivity market (following the Modified Greenfield approach). It is crucial, however, to fully consider the impact of SMP regulations in related markets that could affect competitive conditions in business connectivity markets. These include the proposed UDPA regulation in the upstream physical infrastructure market, and the MUDPA remedy in the WLAMR 2018:

- **The MUDPA remedy:** this remedy mandates regulated access to BT's ducts and poles through Openreach's Physical Infrastructure Access ('PIA') product.[23] CPs can use PIA to deploy local access networks offering leased line and broadband services, provided the primary purpose is the delivery of broadband services.[24]

- **The UDPA remedy:** assuming Ofcom proceeds with its current proposals, UDPA will be the same in all important respects to MUDPA except there will be no restriction on the mix of broadband and non-broadband services delivered by CPs.[25] Under Ofcom's current proposals, BT must make UDPA available within one month of the PIMR 2019 statement in the spring of 2019, and we understand that it will replace MUDPA at this time.

DPA is central to Ofcom's full-fibre vision

34 As noted earlier, DPA is a key element of Ofcom's regulatory strategy to promote competitive investment in fibre networks. Absent regulated access to BT's ducts and pole networks, rival CPs that wish to deploy their own fibre networks must incur the costs and risk of building infrastructure needed to host network cables and equipment.

22 See Annex A2 for further detail on Ofcom's proposals in the BCMR and PIMR 2019.

23 PIA is the regulated wholesale service provided by Openreach in relation to the SMP obligation to provide duct and pole access to rivals.

24 This remedy relaxed the usage restriction prohibiting CPs from using BT's ducts and poles to provide non-broadband services that has been in place since Ofcom first imposed the PIA remedy in its Wholesale Local Access Market Review 2010. Openreach implements the requirement for MUDPA to be used for the primary purpose of the deployment of broadband services by requiring CPs to use PIA to provide leased lines to residential broadband connections in the ratio of at least 30:1.

25 UDPA allows CPs to use PIA to supply only leased lines should they wish to do so.

35 While rivals can, and do, build fibre networks that do not rely on DPA[26], this is more typically viable in areas of high demand where the prospective revenues are sufficient to warrant the sunk cost investment in physical infrastructure or where they have found ways to deploy network in a more cost-effective way.[27] In other areas, access to physical infrastructure can be a barrier to entry and expansion to competitive network investment.

36 DPA reduces the barriers to competitive fibre investments by allowing rival operators to deploy their own fibre using BT's duct and pole network on regulated terms. Ofcom considers that this will promote fibre investment by making it easier and quicker for rivals to rollout fibre without large investments in infrastructure. The proposed UDPA remedy is intended to further increase the attractiveness of DPA by allowing CPs to use BT's PIA product to provide leased line services as well as broadband services without restriction:

> *"We plan to introduce proposals that seek to provide unrestricted access to Openreach's ducts and poles nationwide. An unrestricted remedy would provide greater flexibility, better reflecting the needs of operators investing in full-fibre networks to provide a range of services; for example, initially leased lines to businesses, and later broadband to homes."*[28] *(Emphasis added)*

37 The advantages offered by UDPA, along with the improvements to the PIA product implemented in the MUDPA remedy, will increase CPs' ability and incentive to deploy their own fibre networks. As noted above, this will affect competitive conditions in business connectivity markets during the review period and should therefore be considered in detail in the BCMR 2019.

Ofcom only provides limited analysis of the competitive impact of DPA in the BCMR 2019 consultation

38 In practice, Ofcom's market analysis in the BCMR 2019 consultation focuses on the competitive constraints from self-build network deployment and there is little explicit analysis of the competitive impact of either MUDPA or UDPA. For example, Ofcom does not consider DPA its market definition analysis:

- **DPA is not included in Ofcom's Modified Greenfield approach:** Ofcom states that its market definition analysis for CI access services takes into account the remedies imposed in the WLAMR 2018 in relation to PIA.[29] However, it is unclear how it has done so in practice.

- **Ofcom's network reach analysis only considers self-build:** The analysis of dig distances that underpins Ofcom's network reach analysis for CI access services is based on the costs associated with self-build of network extensions and does not consider the lower costs of deploying fibre using DPA.[30]

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26 [✂]

27 For example, SSE Enterprise Telecoms has a deal with Thames Water to lay fibre optic cables throughout its waste water network.

28 https://www.ofcom.org.uk/__data/assets/pdf_file/0025/116539/investment-full-fibre-broadband.pdf, para. 1.16.

29 See BCMR 2019, para. 4.20.

30 Ofcom explicitly states that the impact of a DPA remedy is not factored into its network reach analysis, which is a fundamental part of its geographic market analysis (see BCMR 2019, para. 5.8).

39 In addition, Ofcom gives only limited consideration to the implications of DPA in its SMP analysis:

- **DPA is dismissed as immaterial in Ofcom's SMP analysis for CI access services:** Ofcom states that any usage of DPA in BT-only and BT+1 markets is unlikely to be widespread within the BCMR 2019 review period and is therefore unlikely to result in effective competition by 2021.[31] Similarly, Ofcom considers that CPs' network expansion plans indicate an absence of potential competition in each of the HNR Metro Areas and in the HNR areas in the rest of the UK.[32]

- **Limited impact of DPA at BT-only exchanges:** Ofcom argues that DPA will not result in effective network competition in the inter-exchange services market at BT-only exchanges in the medium to long-term.

40 Ofcom does, however, give some limited recognition to the potential competitive impact of DPA in its analysis of remedies. For example, Ofcom cites the potential for network deployment using DPA as part of the reason for proposing lighter remedies in HNR Metro and other HNR areas.[33] Similarly, Ofcom states that it will not mandate dark fibre at BT+1 exchanges in the inter-exchange market because of the potential for fibre deployment to these exchanges using DPA.[34]

41 Ofcom's limited consideration of DPA appears to reflect its view that any use of BT's ducts and poles by CPs will be limited during the two-year period of the BCMR 2019 and not sufficient to result in effective competition by 2021. However, Ofcom does not provide any substantive analysis of the likely impact of either the extensive changes BT is making to improve its PIA product following the WLAMR 2018, or the proposed removal of usage restrictions in the PIMR 2019, both of which will increase rivals' ability and incentive to deploy fibre networks.

31 See BCMR 2019, para. 6.70.
32 See BCMR 2019, para. 6.94.
33 See BCMR 2019, para. 10.30.
34 See BCMR 2019, para. 10.20.

3 DPA increases CPs' ability and incentive to deploy fibre in the BCMR 2019 review period

Introduction

42 In this section we explain the reasons why DPA has the potential to materially alter competitive conditions in the review period covered by the BCMR 2019. In short, CPs will be able to use an improved DPA product (i.e. either MUDPA or UDPA) to provide leased lines for the entire two-year period covered by the BCMR 2019, thereby materially improving CPs' ability and incentive to deploy fibre including in business connectivity markets only. For example, DPA will allow CPs to deploy leased lines more quickly, with less risk, and at a significantly lower cost than otherwise by removing the need to build physical infrastructure. DPA will also allow CPs to control the provisioning process for their customers, which will foster greater non-price competition.

43 For these reasons, DPA can be expected to make it more attractive for CPs to develop their own fibre networks to serve leased lined customers, rather than relying on Openreach Ethernet products. DPA is likely to be particularly attractive in the following instances:

- Where CPs wish to aggregate multiple business connectivity circuits in an area (e.g. using DPA to run a single cable with multiple fibres into a business park to connect several customers).
- Where firms, such as SSE Enterprise Telecoms, City Fibre or Virgin Media, use DPA to aggregate demand from multiple CPs to improve the economics of own network build (in addition to using their own duct).
- As part of a widespread strategic multi-service deployment across a specific part of the country (i.e. rolling out a fibre network across a particular area to provide both broadband and business connectivity).
- To make specific deployments to individual customers, particularly for more valuable VHB circuits (we note that with UDPA this need not be part of a wider mixed-usage deployment).[35]

44 [✂]

Improved DPA will be available for the entire BCMR 2019 review period

45 CPs have been able to use MUDPA to deploy fibre for non-broadband connections since May 2018, and as noted below, further important improvements to MUDPA will be available from April 2019. This improved DPA product will therefore be available to CPs for the entire BCMR 2019 review period.

46 Furthermore, Ofcom expects that the introduction of UDPA would lead to minimal disruption for BT and industry[36] and consequently only requires a short implementation period.[37] Accordingly,

35 This does not require that customer to be an anchor tenant for a wider strategic deployment.

36 We understand that under Ofcom's current proposals UDPA will be, from a product description, process and pricing perspective, essentially the same as MUDPA, but with no requirement for CPs to use BT's PIA product primarily to provide broadband services.

37 See PIMR 2019 para. 5.13.

we expect that rival operators will be able to use BT's PIA product with full flexibility shortly after the start of the BCMR 2019 review period.

47 CPs will need to complete Openreach's Customer Establishment Process to use MUDPA and UDPA. However, we understand that this will not change for the improved DPA products and CPs can complete the process before they become available. At December 2018, [✂] have been established to use BT's DPA products meaning they can place live orders. A further [✂] CPs ([✂]) are in the process of becoming 'established'.

The enhancements to DPA address the main historic limitations of PIA

48 Ofcom required Openreach to make several improvements to its existing PIA product in the WLAMR 2018 that aim to increase CPs' incentives to use PIA:

- **Relaxation of usage restrictions**: Ofcom relaxed the PIA usage restriction in the WLAMR 2018 to allow 'mixed-usage'. This gives CPs greater flexibility to use PIA to deploy local access networks that offer non-broadband services, providing the primary purpose of the network is broadband services.[38]

- **Significant reduction in charges**: Ofcom introduced a cap on PIA rental charges, alongside some important changes to the treatment of PIA costs that resulted in a significant reduction in rental.[39]

- **Enhancements to the product and processes:** Ofcom required Openreach to make several important changes to improve PIA products and processes, including: measures to ensure that CPs can access PIA on equivalent terms to BT downstream; access to digital maps to support network planning; and publication of a PIA Reference Offer.

49 Some of these improvements are already in place, including the pricing changes. The remaining changes which are required under the SMP remedies imposed by WLAMR 2018 will be implemented by 1 April 2019.

50 Ofcom has had a key role ensuring these changes are implemented including via hosting the Duct and Pole Implementation Progress Meetings which are also chaired by Ofcom's CEO. These meetings include the CEOs of Openreach, BT Enterprise and several CPs including Hyperoptic, TalkTalk, CityFibre, Virgin Media and Vodafone.

51 As set out above, UDPA will further improve the PIA product by allowing CPs to use it without usage restriction. Ofcom recognises that the removal of the usage restriction will increase CPs' incentive to use PIA and hence increase the likely impact of the DPA remedy:

> *"Limiting the scope of the PIA remedy is likely to materially increase the risk that a telecoms provider may take the view that it is not viable to invest in the first place… [t]he commercial*

38 PIA was first introduced as a remedy in the 2010 Wholesale Local Access Market Review. In its original guise PIA could be used by CPs to deploy local access networks offering broadband services but not to offer non-broadband services and take-up was very limited.

39 For example, the costs of making existing infrastructure ready for use are to be recovered from all users, up to a limit of £4,750 per km, with other ancillary charges cost-based.

business case for the initial investment therefore typically relies on using this capacity to generate as many different revenue streams as possible".[40]

DPA enables CPs to deploy more rapidly

52 DPA will allow CPs to deploy their own fibre faster than if they need to build their own ducts and other physical infrastructure.[41] Building physical infrastructure will generally result in slower roll-out compared to DPA since it involves more extensive survey and planning work, requires more extensive wayleaves and other permissions (e.g. road closures), and involves time-consuming construction work to create and install the necessary civil infrastructure. This benefit of DPA is recognised by Ofcom in the WLAMR 2018:

"By opening up BT's ducts and poles to enable rival operators to install their own fibre … networks can also be deployed much more quickly. For example, while it can take days to build 200 metres of duct using traditional construction methods, fibre cables can be installed in the same length of existing duct in a matter of hours."[42]

53 In addition, the speed of fibre deployment using DPA is largely in a CP's own control, provided it has completed Openreach's Customer Establishment Process.[43] We understand that a CP is required to submit an order, known as a 'Notice of Intent', which Openreach checks and confirms. Once this is done the CP is responsible for undertaking surveys, planning and deploying their infrastructure. In most cases, the CP can determine how quickly these activities are completed, and Openreach has no significant involvement at this stage, provided no network adjustments are needed to ensure that BT's physical infrastructure is ready for use.

DPA allows CPs to better control the customer experience

54 CPs that use DPA are not reliant on Openreach to make the physical infrastructure connections to customer premises or to provision equipment. This allows CPs to better control the end-to-end customer experience compared to Openreach's wholesale Ethernet services and, therefore, provides CPs with opportunities to compete on further non-price grounds.

DPA significantly reduces own-fibre deployment costs

55 The costs of installing duct and related physical infrastructure typically represent a large proportion of the upfront costs of fibre deployments incurred by CPs. By allowing CPs to deploy fibre without building infrastructure, DPA will significantly reduce the cost of own-fibre deployments. This is recognised by Ofcom in the WLAMR 2018:

"By opening up BT's ducts and poles to enable rival operators to install their own fibre networks, we estimate that the up-front costs of building fibre networks could be reduced

40 See PIMR 2019, para. 5.22.

41 Deployment based on PIA can be relatively fast once a CP has determined where it wants to deploy, since the main activities are to carry out local survey work, establish a physical connection to Openreach's duct network from its own network (if this has not been done already), blow fibre and (if required) tubing, and install equipment.

42 See WLAMR 2018, para. 1.7.

43 See Openreach's *Duct & Pole Access Physical Infrastructure Access (PIA) Product Description: Draft Reference Offer*, November 2018.

by around 50%... Effective access to existing ducts and poles can transform the business case for investing in full-fibre networks."[44]

"Our DPA remedy could transform the business case for companies investing in fibre – lowering the upfront cost by around 50% and reducing the time to market, leading to greater investment in alternative networks in the future."[45]

56 The importance of physical infrastructure costs in the total cost of self-build depends on the distance over which infrastructure is deployed. The economic dig distance model used by Ofcom in the BCMR 2019 implies that the cost of deploying new duct can be materially greater than 50% for leased lines. To illustrate, Ofcom's model indicates that the cost of providing a 1Gbit/s circuit which requires 100 metres of new duct construction is £11,000 in present value terms over five years, but only £2,300 if the duct is already in place.[46]

57 Our analysis of Ofcom's dig distance model, which we have adjusted to incorporate DPA,[47] suggests that if CPs were to use DPA instead of establishing their own duct infrastructure, the discounted cost of the 1Gbit/s circuit over 5 years would be around £3,200. This is clearly a considerable saving on the £11,000 required to self-build the physical infrastructure.

DPA significantly reduces the risks of own-fibre deployment

58 Constructing physical infrastructure assets involves large up-front sunk investments that can only be recovered over long periods. While CPs can sometimes achieve longer minimum contract terms for certain retail business connectivity services (e.g. to provide backhaul from mobile cell sites), for most retail leased lines the typical minimum contract term is 5 years or less[48]. Such contract lengths are unlikely to be sufficient to fully recover infrastructure costs.

59 CPs therefore face a risk of non-recovery, particularly where competition from rivals using Openreach's Ethernet portfolio products limits the scope for accelerated recovery of the duct costs. DPA lowers this risk by reducing the extent to which CPs must make up-front investments. Although we understand that PIA requires a minimum commitment from CPs of 5 years for certain products (e.g. spine duct), this is generally a smaller outlay than would be required with self-build, and better reflects the likelihood of cost recovery at the retail level.

44 See WLAMR 2018, para. 1.7.

45 See WLAMR 2018, para. 1.28.

46 These figures are based on Scenarios 3 and 2b respectively in Ofcom's model.

47 The assumptions we have made to adapt Ofcom's model are set out in Annex A1. The PIA cost estimate is discounted using the same approach and assumptions used by Ofcom for considering the on-going rental charges for EAD LA. As we set out in Annex A1, we have adopted a highly conservative approach to incorporating DPA into Ofcom's modelling.

48 For example, see Figure 8.1 of the *Business Connectivity Services Review*, May 2015 produced by BRDC for Ofcom (https://www.ofcom.org.uk/__data/assets/pdf_file/0026/57491/bcmr_2014_report-bdrc.pdf) or paragraph 2.6 of *Business Connectivity Market Assessment*, March 2018 produced by Cartesian for Ofcom (https://www.ofcom.org.uk/__data/assets/pdf_file/0009/113112/cartesian-business-connectivity-market-assessment.pdf).

DPA will materially increase the competitive constraints on BT in some areas

60 DPA will increase the scope for CPs to profitably deploy fibre networks to provide leased line services. As set out above, CPs are likely to use DPA in a variety of ways, including:

- **Tactical** deployments of individual leased line circuits to particular customer sites, or to aggregate multiple business connectivity circuits in an area (e.g. to run a single cable with multiple fibres into a business park to connect several customers, or to provide backhaul to multiple cell sites on a route). The proposed UDPA remedy will facilitate this by removing the usage restriction that only allows DPA to be used to provide leased line circuits as part of a wider mixed-usage deployment. [✂]

- As part of a more **strategic** multi-service deployment (e.g. comprising broadband and non-broadband services) to a broader region or area. DPA is likely to be particularly attractive for this type of deployment since it will allow CPs to benefit from economies of density and scope. Multi-service operators may, for example, seek to secure one or more 'anchor tenants', such as a local council, or a business park, or indeed a mobile operator and then build out a wider network using DPA.[49]

61 In the tactical deployment use case, a CP will consider the least-cost way of providing the required service when responding to a customer's tender. Absent DPA, the CP will face a choice between purchasing an Openreach wholesale Ethernet service or self-supply using its own physical infrastructure.[50] In general, the self-build option will make economic sense only for higher value and shorter connections. Historically, this is the key reason why CPs have relied on BT's Ethernet services in many circumstances. By reducing the cost and risk of network extensions DPA will make it economic for CPs to carry out network extensions over longer distances in a wider range of circumstances. This will increase the incentive for a CP to deploy its own network and allow it to bid more competitively in tenders for business connectivity services.

62 The incentive to use DPA may be particularly strong in some strategic deployment use cases, given the potential to capture economies of scale and scope that would not be possible using Openreach's wholesale Ethernet products.

Illustrating the impact of DPA on deployment costs

63 The potential for DPA to reduce CPs' deployment costs in the tactical use case can be illustrated by comparing the total cost of ownership ('TCO') of a circuit provided using Openreach's Ethernet products to the TCO using DPA. We have derived TCO estimates for these options using an amended version of Ofcom's economic dig distance model that incorporates the cost of

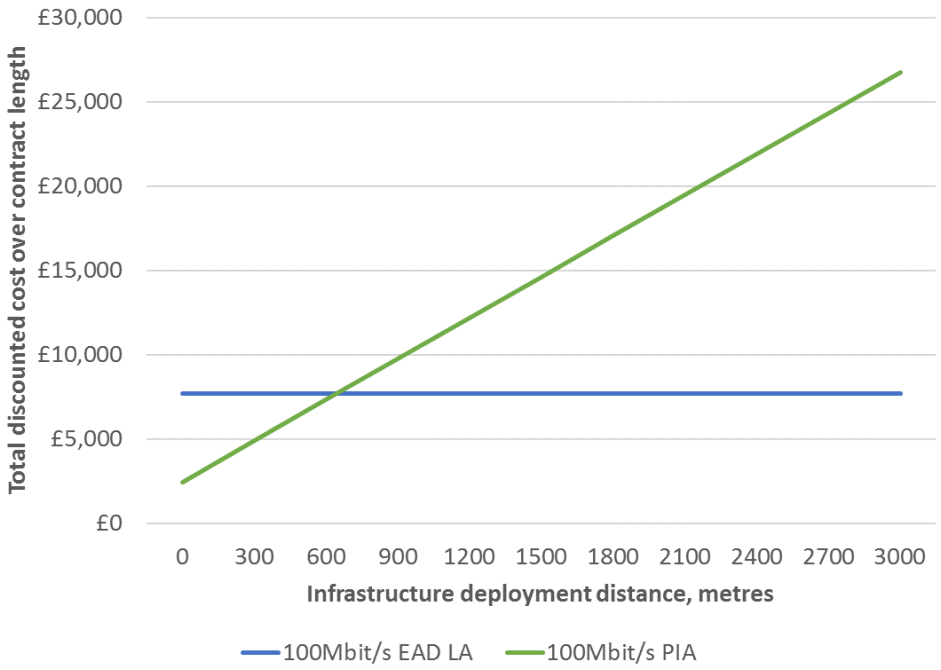
[49] There are various potential models for doing this. For example, we understand that SSE Enterprise Telecoms is working with both Three UK and Telefonica UK to aggregate their backhaul demand.

[50] Third-party wholesale services are a potential third option, where available.

deployment using PIA (see Annex A1 for details).[51] Based on this, we can assess the least-cost option in relation to individual circuits of different bandwidths, given the deployment distance.[52]

64 Figures 2 to 4 below show the five-year TCOs for 100Mbit/s, 1Gbit/s and 10Gbit/s circuits respectively. The analysis compares purchasing an Openreach EAD LA[53] to own-fibre deployment using DPA to assess the breakeven distance (i.e. the maximum route distance over which DPA is least cost option). As we set out in Annex A1, our analysis uses a conservative set of DPA assumptions.[54] A less conservative approach would result in longer breakeven distances.

Figure 2: Five-year total cost of ownership, 100Mbit/s EAD LA versus own-fibre deployment using DPA (PIA)



Source: AlixPartners

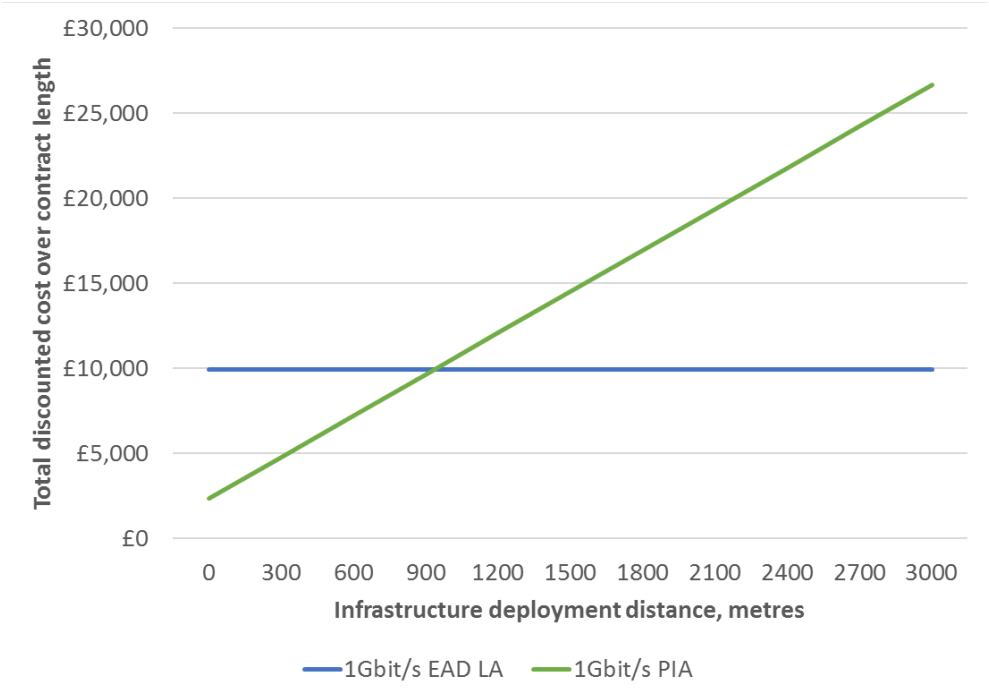
51 Our use of Ofcom's economic dig distance model should not be interpreted as our agreement with all aspects of Ofcom's calculations. Rather, it provides a practical method to illustrate the order of magnitude of the impact of including DPA into Ofcom's framework.

52 The distances in this analysis refer to route distance rather than the (shorter) radial distance used to calculate network reach in Ofcom's geographic market analysis. Route distance is appropriate here as it relevant measure of the resources used by a CP in providing a connection using DPA.

53 The focus on EAD LA is consistent with Ofcom's approach. EAD circuits are typically more expensive (for a given bandwidth). Therefore, we would expect the breakeven distance to be longer for EAD, all else being equal.

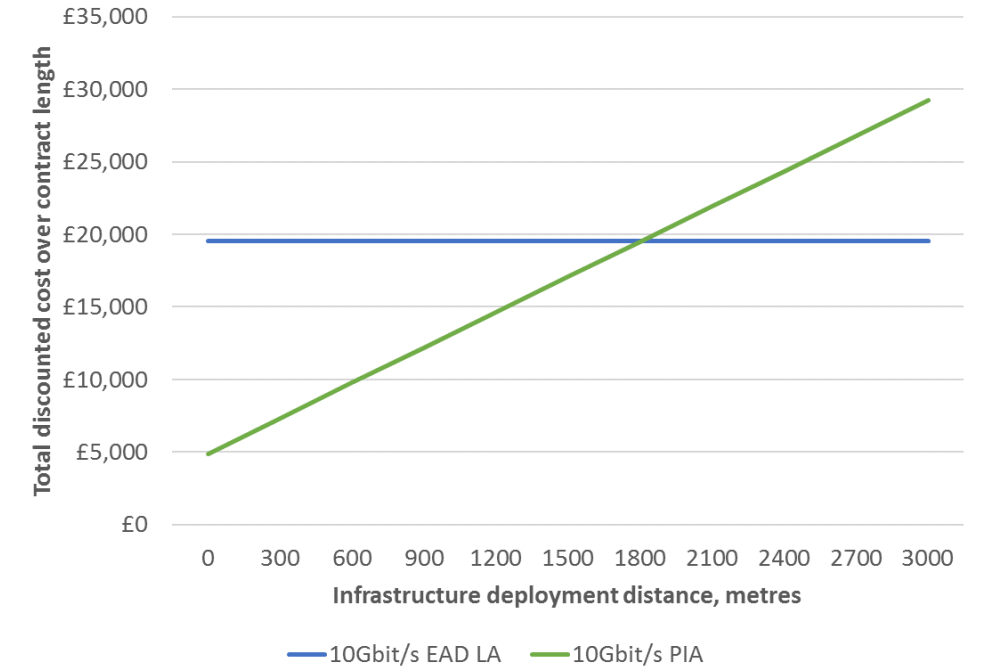
54 For example, assuming all duct is single bore (i.e. the most expensive form of duct) and including charges for blockage clearance which we understand will typically not apply in the revised network adjustments regime that will come into force in April 2019.

Figure 3: Five-year total cost of ownership, 1Gbit/s EAD LA versus own-fibre deployment using DPA (PIA)



Source: AlixPartners

Figure 4: Five-year total cost of ownership, 10Gbit/s EAD LA versus own-fibre deployment using DPA (PIA)



Source: AlixPartners

65 The analysis suggests that DPA will result in significant cost savings which will incentivise CPs to switch to DPA, particularly for shorter, higher bandwidth circuits. In particular, the analysis suggests that for extensions up to c.650m for 100Mbit/s, c.940m for 1Gbit/s, and c.1810m for

10Gbit/s circuits it is cheaper for CPs to extend their own networks using DPA rather than using an Openreach EAD LA circuit.[55]

66 The incentive to use DPA will be greatest when CPs are supplying a customer site for the first time and hence must pay the upfront costs associated with an Openreach Ethernet service connection charge. However, CPs may also seek to migrate customers who they currently supply using an Openreach EAD or EAD LA connection if this is expected to result in sufficient cost savings over the remainder of the customer lifetime.[56]

67 Given this profit incentive we would expect such deployments to happen rapidly and within the timeframe of the BCMR 2019 review period.[57] However, unlike Ofcom, we do not have access to detailed data on the location of CP networks. Therefore, we are unable to estimate what proportion of Openreach wholesale Ethernet circuits could be vulnerable to DPA substitution given such breakeven distances. However, the analysis set out in the next section implies it could be material.

55 These figures refer to route distance, not radial distance.

56 Moreover, CPs may see advantages in switching existing customers to DPA mid-contract to better enable them to compete for future contract renewals.

57 We note that the incentive and ability to use DPA will depend on whether there is sufficient duct space available, and on the prevalence of duct blockages. Ofcom has previously found that 63% of 90mm duct ends and 97% of 50mm duct ends surveyed in 2010 had at least 42% of unoccupied space (Ofcom, 2016. *Making communications work for everyone: initial conclusions from the Strategic Review of Digital Communications*, para. 4.27). Although BT stated that not all of this duct will be usable, this suggests that any restrictions on the usage of DPA are more likely to be localised rather than general. We note that Ofcom does not identify duct availability as a key constraint in its market analysis in BCMR 2019.

4 DPA has significant implications for the BCMR 2019 market analysis

Introduction

68 For the reasons set out in Section 3, DPA will materially increase CPs' ability and incentive to deploy their own fibre networks in the BCMR 2019 review period. As we have shown above, DPA will increase the scope for profitable fibre deployments by making it more economic for CPs to deploy networks over longer distances and in more areas that would otherwise be possible if they had to invest in physical infrastructure. This will result in an increase the number of CPs capable of serving business sites within given areas, including in the HNR Metro areas identified by Ofcom.

69 Given the profit incentive for CPs to switch to DPA, we would expect such deployments to happen rapidly, particularly for shorter and higher bandwidth circuits. Accordingly, we expect that DPA will result in an increase in network competition in some areas and the erosion of BT's market power during the BCMR 2019 review period. This is likely to affect competitive conditions in mixed deployments of FTTP using DPA, as well as in deployments of high capacity leased line connections. For example:

- By allowing CPs to provide connections more cheaply and easily than otherwise, DPA will increase the competitive pressure on Openreach's wholesale Ethernet products.
- Moreover, as explained further below, BT can be expected to take the potential competition due to DPA into account which will ensure that it offers competitive terms and conditions for its Ethernet services (and its retail business connectivity products).

70 The increase in network competition due to DPA has important potential implications for Ofcom's market analysis and remedy design in the BCMR 2019 which we discuss below.

Geographic market definition

71 We focus on the impact of DPA on geographic market definition since the extent to which DPA results in network deployment by CPs is likely to vary geographically. We note that DPA may also have consequences for product market definition, for example, because CPs may have a particularly high incentive to use DPA in tactical deployments to provide high value VHB circuits.

CI access service market

72 Ofcom's analysis of geographic markets for CI access services is based on an analysis of the proximity of business locations to CP networks (including BT's network). This analysis is sensitive to the buffer distance that is used to define network reach, as Ofcom acknowledges:

> *"The analysis shows that the geographic definition is sensitive to the choice of buffer distance used and that a wider buffer distance would result in us defining larger areas as having HNR […] This result is to be expected as increasing the buffer distance means that more distant networks will be identified as sufficiently proximate to the customer. This will*

increase the proportion of customers with higher network reach in any given postcode sector."[58]

73 Ofcom assumes a buffer distance of 50m, based on its analysis of the economic dig distance. This analysis compares the cost to a CP of providing individual business connectivity circuits using Openreach's Ethernet products (i.e. EAD LA) versus an extension of its own network.[59] Ofcom cross-checks its dig distance findings against evidence of actual dig distances by CPs and notes that:

> *"A 50m buffer distance is also consistent with actual digging behaviour for circuits at all bandwidths. Telecoms providers excluding Openreach chose to build in less than 10% of their 2017 new customer ends where they did not already have an existing duct connection. This is consistent with evidence from customers that the length of time taken to install a new connection is a factor in choosing a supplier and that, based on our analysis, connection times are significantly longer when duct work is involved."*[60]

74 The observed actual dig distances relate to a period in which CPs were not able to use DPA to provide leased lines and hence reflect the impact of the high cost of network extensions that involve the construction of physical infrastructure. These are not relevant when considering operators' willingness to deploy fibre using DPA, since this does not involve duct work. Furthermore, as explained above, fibre deployment via DPA is likely to be faster than self-build without DPA and is also largely within a CP's control.

75 We have analysed the potential impact of DPA on the distance over which it is economic for a CP to extend its network to connect a new customer site using Ofcom's economic model of dig distance which we have adjusted to include DPA.[61] Our approach has been to make only those changes to Ofcom's model that are necessary to illustrate the impact of consuming DPA from Openreach on a CP's cost stack.[62]

76 Ofcom's economic dig distance model considers three different network deployment scenarios:

- **Network extension**: where a CP needs to deploy new duct and fibre.
- **Duct connected without tubing**: the CP does not need to deploy new duct but does need to deploy tubing and blow fibre.
- **Duct connected with tubing**: the CP only needs to blow the fibre.

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58 See BCMR 2019, para 13.11 and 13.12.

59 In para. 5.17 Ofcom sets out that "*To determine the buffer distance, we have considered evidence on how close operators need to be to a customer site for them to extend their network. This evidence is the same as that used in accessing supply-side substitution in Section 4 and is presented in more detail in Annex 10.*" Annex 10 is titled 'Economic dig distance and cost analysis'.

60 BCMR 2019, para. 5.19.

61 We note that the published version of the economic dig distance model produces results that are slightly different to those presented in Table A10.6. It is not clear to us what drives this difference. The results we present in this section are based on the Excel model released by Ofcom.

62 Only making the minimum necessary changes to Ofcom's model should not interpreted as our agreement with all aspects of Ofcom's calculation. Rather it is intended to maintain consistency with Ofcom's existing approach.

77 Our analysis of the impact of DPA on CP deployment distances considers the scenario where the required duct is connected but without tubing or fibre. We have adjusted the inputs in Ofcom's model to include the cost to the CP relating to Openreach's PIA charges. Our analysis therefore assumes the CP will need to deploy tubing, blow fibre, provide the electronics, but will rent duct access using PIA. We explain our adjustments to Ofcom's modelling in Annex A1.

78 Table 1 shows the estimated dig distance using DPA alongside Ofcom's estimated dig distances for self-build. In Table A10.6 of the BCMR 2019 consultation Ofcom only reports the results for three and five-year payback periods. However, its model also produces results for a seven-year period. Given that we understand that longer minimum contract terms can particularly arise in relation to VHB circuits used for backhaul, for example, we have also presented the results for a seven-year payback period.

Table 1: Comparison of economic radial[63] network extension distances based on own-duct deployment and use of DPA, metres

	Network extension (new duct required)	Network extension (using DPA)
Three-year payback		
EAD LA 100Mbit/s	27	284
EAD LA 1Gbit/s	43	433
EAD LA 10Gbit/s	105	1,069
Five-year payback		
EAD LA 100Mbit/s	47	463
EAD LA 1Gbit/s	69	670
EAD LA 10Gbit/s	129	1,292
Seven-year payback		
EAD LA 100Mbit/s	63	575
EAD LA 1Gbit/s[64]	97	934
EAD LA 10Gbit/s	165	1,590

Source: AlixPartners

79 This analysis shows that:

- DPA allows CPs to economically address demand 10 times further away from their existing networks than own-build network extensions.

63 Radial distances are calculated using the same route-to-radial conversion factor (i.e. 1.4) assumed by Ofcom. We are not in a position to assess the validity of this assumption or whether an alternative would be more appropriate in these circumstances with the information available to us.

64 Ofcom's modelling uses Openreach's 84-month term discount charges for 1Gbit/s circuits in the seven-year payback scenario. These charges are, in fact, higher than the 60-month term discount charges. Therefore, in practice CPs are unlikely to sign up to the 84-month term discounts – they are more likely to use the 60-month term discount charges for all retail circuits sold for 5 years or longer. Given this, the breakeven distances estimated for 1Gbit/s over a seven-year payback are conservative in this respect.

- DPA enables CPs to provide their own fibre connections to end users cheaper than even the cheapest Openreach wholesale Ethernet services (100Mbit/s EAD LA services) for distances up to just under 300m even based on just a three-year payback period.

- For higher bandwidth services, particularly over longer contract terms, DPA allows cheaper deployment for even greater distances (i.e. up to c.1.6km using a seven-year payback period).

80 These results indicate that DPA will increase the economic network extension distances far beyond the 50m buffer distance assumed by Ofcom. This clearly illustrates the potential for DPA to allow CPs to profitably supply individual leased lines by extending their networks over much greater distances. As explained in Section 3, DPA is likely to have an even greater impact where it is used by CPs to aggregate multiple business connectivity circuits in an area, or as part of a strategic multi-service deployment to a broader region or area. In both cases the CP would benefit from the economies of density and scope that arise with such deployments using DPA.

81 We do not have access to the detailed information on CP network locations that Ofcom has used for its geographic analysis. As a result, we are unable to model the impact of a more appropriate buffer distance assumption on competitive conditions at the postcode sector level. However, the sensitivity analysis undertaken by Ofcom shows that increasing the buffer distance from 50m to 100m, the number of postcode sectors classified as 'high network reach' ('HNR') more than doubles from 576 to 1,261.[65] Furthermore, the number of postcode sectors categorised as 'BT Only' falls by over 20%.

82 Our analysis suggests that a 100m buffer distance would still be highly conservative, and that a distance of at least 300m would be more appropriate. While we are not able to assess how this would affect the classification of postcode sectors, appropriate consideration of DPA would likely result in many more postcode sectors that are currently considered to be BT-only or BT+1 in the BCMR 2019 consultation being more appropriately reclassified as HNR areas, given the greater expected presence of rival networks in the market review period.

CI inter-exchange market

83 DPA is also relevant to the CI inter-exchange market since it will reduce the costs for CPs of establishing a presence at BT exchanges. We note that the prevalence of VHB circuits is likely to be higher in this market since CPs typically require considerably higher bandwidth for exchange connectivity. This is important as CPs will find it economic to deploy their own fibre over much longer distances for VHB connections. To illustrate, our amended version of Ofcom's economic dig distance model implies that it is more profitable for a CP to use DPA rather than EAD LA 10 Gbit/s for circuits up to c.1.6km.[66]

84 Ofcom's quantitative analysis of the inter-exchange market is more limited than for the CI Access market which limits our ability to assess the precise impact of DPA on the CI Inter-Exchange market definition. In particular, Ofcom only provides information on measures of the average distance[67] between BT exchanges and the 1st and 2nd closest rivals.

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65 As set out in Table A13.1 of the BCMR 2019 consultation. We assume the network coverage threshold remains unchanged at 65%.

66 This is based on a 7-year economic life since CPs are likely to consider longer time horizons for exchange connectivity than customer-specific deployments.

67 Measured by the mean and median distance.

- For 'BT Only' exchanges, Ofcom's estimates of the average distance to rivals is substantial at more than 6km. While this is considerably longer than the c.1.6km figure given above, there is likely to be considerable variation around this average. Given the potential for CPs to build out to an exchange on an individual exchange basis, it is therefore important to consider the impact of DPA on network deployment on an individual exchange basis. However, Ofcom does not appear to have carried out such a disaggregated analysis. Appropriately done, this may indicate that DPA will enable multiple CPs to deploy their own fibre to some of the BT-only exchanges (particularly where a CP has multiple VHB circuits connected to the exchange).

- For 'BT+1' exchanges, Ofcom estimates the median distance to the 2nd closest rival is considerably shorter at 319m. This is well within the DPA economic network extension distances reported in Table 1 above for all 1Gbit/s and 10Gbit/s scenarios considered. Furthermore, Ofcom's estimate of the average distance to the 2nd closest rival of 1,531m is within the DPA economic distance for a 7-year 10Gbit/s circuit (i.e. 1.6km).[68]

85 This analysis suggests that Ofcom has understated the likely proportion of BT+2 or more and BT+1 exchanges over the BCMR 2019 period.

SMP analysis

86 DPA is also likely to have implications for Ofcom's SMP analysis in both the CI access services market and the CI inter-exchange connectivity market.

CI access services market

87 Ofcom's SMP assessment is, in large part, predicated on BT's control of its duct and pole network. As we have explained, DPA allows BT's downstream rivals equivalent access to its duct and pole network, ensuring that the competitive advantages that BT has historically derived will be available to all CPs.

88 BT's historically high market/service shares in certain business connectivity markets will reflect this advantage since neither the enhancements to the existing DPA product nor the proposed UDPA changes were available in the period covered by Ofcom's market share analysis. These enhancements to DPA will increase the contestability of leased lines in the BCMR 2019 review period, particularly in HNR areas, gradually eroding BT's market/service share over time. Accordingly, BT's current market/service shares are likely to overstate BT's actual market power in the CI access services market.

89 These considerations imply that Ofcom should reconsider its SMP findings, taking DPA into account. Furthermore, Ofcom should place greater weight on the competitive impact of DPA on actual and potential network competition[69] in the review period, with less importance attached to historic market/service shares:

- **Increased actual network competition:** network deployment by CPs using DPA in the review period will increase network presence in BT only and BT+1 postcode sectors. If this is on a sufficient scale to meet the 65% network threshold this will result in some BT only areas

[68] We note that the sizeable difference between the median and average distances in Table A12.19 is indicative of the wide distribution of distances we would expect to observe.

[69] In appropriately defined geographic areas where it finds competitive conditions to be sufficiently homogeneous, see paragraph 351 of the Competition Appeals Tribunal judgement in Case No. 1260/3/3/16.

becoming BT+1 and potentially HNR areas, and some BT+1 areas becoming HNR areas. Similarly, increased network deployment using DPA in BT+2 areas may increase the competitive constraint on BT sufficiently to result in an absence of SMP in some of the HNR Metro and other HNR areas.

- **Stronger potential competition:** for similar reasons, DPA will also strengthen the competitive constraints from potential or likely future network presence. This can be expected to arise in two ways. First, DPA will lead to a sustained reduction in the cost of own-fibre deployment for CPs. As set out above, this increases the likelihood of CPs using DPA (in combination with their own or third-party fibre) rather than Openreach's wholesale Ethernet services (all else being equal). Openreach will be cognisant of this increased threat of switching, which will directly constrain its terms and conditions for its Ethernet services. Second, Openreach can be expected to face an indirect constraint from competition downstream. If it expects its Ethernet customers (i.e. CPs) to face greater retail competition from rivals bidding for contracts based on using lower cost DPA-based services, this will also act as a constraint on Openreach's Ethernet terms and conditions. Neither the direct nor indirect constraints rely on CPs currently using DPA, or in the case of indirect constraints, bidding being based on using DPA. Rather, they rely on Openreach considering the use of DPA by rival CPs to be sufficiently credible. For the reasons we have set out in this report, CPs are likely to have both the ability and incentive to quickly take-up DPA (i.e. within the BCMR 2019 review period).

90 In our judgement, if Ofcom was to place greater weight on the competitive impact of DPA over the review period it would likely find materially more areas will tend towards being effectively competitive over the review period. This is particularly the case in HNR Metro and other HNR areas where CPs already have a material degree of network presence which is located closer to customer sites.

91 Ofcom considers that:

> *"There are no prospects of potential competition that can effectively constrain BT in BT-Only and BT+1 geographic markets by 2021. This is already reflected in the limited availability of existing rival infrastructure."*[70]

92 Ofcom explains that most of the responses from telecom providers indicate that their network extension plans are on a very small scale or related to core networks, and also that any use of duct access is unlikely to be widespread in the review period.[71] However, the significance of operators' stated network investment plans for Ofcom's competition analysis depends upon the extent to which they actually took the planned introduction of the DPA remedy into account.

93 It would not be surprising if CPs' investment plans previously shared with Ofcom did not incorporate the use of DPA. CPs may not reflect regulatory remedies into their network plans until the introduction of such remedies, and the terms upon which they will be based, are sufficiently clear. The Reference Offer for MUDPA is still to be finalised. Furthermore, Ofcom's detailed UDPA proposals were only published (in the PIMR) alongside the BCMR 2019 consultation. Therefore, Ofcom's specific UDPA intentions may not have been sufficiently clear to CPs for them to be reflected in their formal network plans when they were requested by Ofcom. If CPs' plans have

70 BCMR 2019, para. 6.70.

71 BCMR 2019, para. 6.71 to 6.73.

not factored in the possibilities enabled by DPA, they cannot be used as evidence that DPA "*is unlikely to be in widespread use*" in the review period and "*therefore unlikely to lead to effective competition by 2021*".[72] In practice, CPs may focus on identifying where there are profitable opportunities to flex or adapt investment plans using DPA. Given this, Ofcom should ask CPs to provide sensitivity or scenario analysis carried out to explore potential uses of DPA, as well as the results of any DPA pilot studies undertaken.

94 A further consideration is that because retail business connectivity contracts typically last for longer than a year (often up to 5 years, and potentially longer in relation to anchor tenants or VHB customers) only a proportion of circuits are tendered in each year. As a result, the immediate impact of DPA in terms of lowering deployment costs for BT's rivals will only result in observable changes in market shares and network presence that develop progressively over time as CPs use DPA to address new customer demand as it arises. This means that changes in market shares and network presence can be expected to be a lagged indicator of the increase in competition that will arise throughout the review period due to the introduction of DPA. In addition, the potential change in market shares over the review period will be naturally limited by the importance of multi-year contracts in business connectivity markets (e.g. a 3-year contract from 2018-21 will not be contestable within the review period).

95 DPA can be expected to result in increased potential competition within the review period if Openreach considers it sufficiently likely that competition from CPs using DPA will arise, as set out above. This competitive constraint will result in downward pressure on BT's prices which will be observable in advance of changes in market shares and network presence.

CI inter-exchange services market

96 As noted earlier, our analysis of deployment distances using DPA indicates that CPs could profitably extend their network over longer distances than those considered by Ofcom based on self-build costs. This should be fully considered on an individual exchange basis. This is likely to show that more BT-only and BT+1 exchanges are prospectively competitive over the review period and hence should not be found to have SMP.

Remedy design

97 Ex ante remedies should only be applied in markets where BT has SMP. In addition, remedy design should be sensitive to the degree to which BT has SMP to ensure that remedies are proportionate to the potential competitive concern, taking account of the risk that regulation may itself undermine the scope for network investment and competition. The importance of designing regulation to incentivise investment in potentially competitive areas is clearly recognised by Ofcom:

> *"In potentially competitive areas, we want to create the best environment to incentivise investment. We would design regulation to encourage network deployment, recognising that competing providers will only invest in building their own networks if this is more attractive than buying wholesale services from BT."*[73]

[72] BCMR 2019, para. 6.74.

[73] Ofcom, 2018. Regulatory certainty to support investment in full-fibre broadband, para.4.15.

98 Ofcom has proposed remedies that vary across the relevant geographic markets for both CI access services and CI inter-exchange connectivity. Ofcom explains that this reflects the variation in network competition and, in the case of HNR Metro and other HNR areas in the CI access services market, the likely availability of DPA during the review period. However, our analysis suggests that Ofcom has not appropriately assessed the potential competitive impact of DPA on the business connectivity markets in the BCMR 2019 review period. This undermines the robustness of Ofcom's proposed market analysis findings, with the risk that the proposed regulatory remedies are incorrectly applied in areas where effective competition either exists now or is likely to emerge during the BCMR 2019 review period.

99 Where Ofcom has taken into account DPA and finds that BT has SMP, it is also important that it considers the increased actual and potential competition enabled by DPA when designing remedies. For example:

- **In HNR Metro areas (and beyond for VHB)**: Ofcom should consider removing the requirement to provide wholesale access in the CI access services market where there is sufficient actual and potential network competition based on DPA. Network investment based on DPA is likely to emerge more rapidly in the HNR Metro areas than elsewhere, since CPs already have material network presence and network deployment distances are typically relatively short.[74] Since DPA will allow CPs to deploy fibre profitably further from their existing networks it is likely to increase their ability to contest a greater proportion of business sites in HNR Metro areas. Moreover, as explained above, by lowering the cost of network extensions DPA will increase the competitive constraint on BT; the greater threat of entry using DPA can be expected to intensify potential competition in advance of further network deployments. For these reasons, DPA is likely to have a particularly significant impact in the HNR Metro areas, with the result that competitive conditions will be more similar to the CLA. Similarly, given the higher value nature of VHB circuits, CPs can be expected to use DPA to deploy fibre profitability further from their existing network, including outside HNR Metro areas.

- **In the other CI access markets:** as set out above, the availability of DPA may mean that for some areas network competition will materially increase during in the review period, but not to the point where Ofcom considers it to be sufficient to alter its SMP finding. In such areas, Ofcom should consider whether it is proportionate to apply more intrusive remedies (e.g. the proposed charge control, minimum quality of service remedies and equality of inputs obligations). The fact that volume or geographic discounts (unlike term discounts) do not count towards charge control compliance reduces Openreach's incentives to lower its wholesale Ethernet prices to win customers in those parts of the country where its costs are lower than average (and to charge more where costs are higher).[75] This restricts Openreach's ability to compete on price and also risks creating an inefficient misalignment of prices and costs distorting CPs' investment incentives. These distortions could result in higher industry costs that are passed on to customers in higher prices, potentially lowering take-up of fibre services.

74 Ofcom's dig distance analysis shows that 80-90% of businesses in the Metro areas have at least two rival networks within 50m (see Table 6.6 of BCMR 2019). Furthermore, in the HNR areas outside the CLA, Ofcom finds that the average distance to the third rival is only 134m, while the for the fourth it is 387m (see Table 6.9).

75 See BCMR 2019 volume 2, para. 5.19.

Such outcomes are undesirable and would undermine the policy goal of promoting network competition, deregulation and the development of high speed fibre services in the UK.

- **In the CI inter-exchange market:** Ofcom should reconsider its proposal to require BT to provide dark fibre at BT-only exchanges in this review. Ofcom proposes that BT should be required to provide dark fibre only in areas where it is confident that network competition is unlikely to develop in the medium to long term.[76] We agree that it is appropriate to err on the side of caution in view of the risk that regulated dark fibre will undermine fibre investment. However, as noted above, Ofcom would need to consider the impact of DPA on competitive conditions at individual exchanges to fully understand the potential for investment by CPs. In the absence of such an analysis (and assuming it is possible to conclude with reasonable certainty the DPA would not be sufficiently used), it seems premature to require dark fibre at this stage given the risks to investment.[77]

[76] BCMR 2019, para. 10.15.

[77] Without prejudice to the issues BT Group and Openreach raise in their responses to the PIMR and the BCMR challenging the proportionality of the dark fibre remedy.

A1 Updating Ofcom's economic dig distance model to include DPA

A1.1 Introduction to Ofcom's model

100 One of the key assumptions Ofcom uses in its network reach analysis is the buffer distance. This is the distance Ofcom uses to identify whether rival networks are sufficiently proximate to business locations.[78] Ofcom proposes to assume a buffer distance of 50m.[79]

101 As set out in Section 4, the buffer distance assumption is based on the distance that it could be economic for operators to extend their network to supply a customer. To establish this assumption Ofcom developed an economic dig distance bottom-up model for BCMR 2019. This Excel model is found in Annex 16 of BCMR 2019[80]. An explanation of the spreadsheet, and the results, is set out in Annex 10.

102 The model identifies the furthest distance operators would be willing to deploy their own infrastructure for a single leased line based on Openreach's current Ethernet (i.e. EAD LA) prices. Openreach Ethernet charges do not depend upon distance[81] but several of the costs incurred in own-infrastructure deployment do. Therefore, the model solves for the break-even distances for different circuit bandwidths and contract lengths. The model also considers different deployment scenarios for CPs:

- **Scenario A: Network extension** - where a CP needs to deploy new duct and fibre.
- **Scenario B: connected without tubing** - the CP does not need to deploy new duct but does need to deploy tubing and blow fibre.
- **Scenario C: Duct connected with tubing** - the CP only needs to blow the fibre.

103 The model is bottom-up[82], based on the following activities:[83]

- One-off distance-related passive activities:
  - Blown fibre tubing;
  - Blown fibre;
  - Duct under a footway;
  - Duct under a carriage way;

78 The buffer distance is a radial (i.e. straight line) distance, not the route distance.

79 See BCMR 2019 consultation, paragraph 5.18.

80 We note that the published version of the economic dig distance model produces results that are slightly different to those presented in Annex 10. It is not clear to us what drives this difference.

81 Up to the maximum distances for each product.

82 i.e. it builds up the costs from the individual activities required for each scenario

83 Not all activities are relevant to each scenario. For example, duct costs are not relevant in those scenarios where there is existing duct.

  - Blockage clearance; and
  - New footway boxes.
- One-off distance-independent passive activities:
  - Survey; and
  - Break through external wall(s) at customer premise.
- Active costs:
  - Electronic equipment and installation costs.

104 Ofcom makes some assumptions about the prevalence of these activities for leased lines, including:

- Duct is assumed to be 90% under a footway and 10% under a carriage way;
- A new footway box is required for every 100m of new duct;
- A customer wall break-through is required when there is new duct;
- There are 1.5 blockages per kilometre when tubing is required in existing duct[84]; and
- A survey is required in all scenarios.

105 The unit costs for each of the activities are sourced from BT's Excess Construction Costs ('ECCs') price list[85] except for:

- Blockage clearance costs – sourced from BT's PIA price list; and
- Electronic equipment and installation costs – sourced from BT's 2017/18 RFS information.

106 Costs that are incurred over time are discounted using a discount rate of 9%.

107 The model outputs are based on route distances. These are converted to radial distances using a route-to-radial factor of 1.4.

A1.2 Incorporating DPA into Ofcom's model

108 Ofcom's model only considers CP build-buy decisions based on CPs building their own infrastructure. To illustrate the impact on economic network extension distances of CPs using DPA

84 This is the low case scenario. Ofcom also includes a high case scenario (which is not apparently used) of 2.0 blockages per kilometre.

85 i.e. Ofcom assumes that CP deployment costs are the same as BT's ECC charges.

we have made changes to Ofcom's model. Our approach has been to make only those changes that are necessary to illustrate the impact of consuming DPA on a CP's cost stack.[86]

109 Our analysis is based on the scenario where the required duct is connected, but without tubing or fibre (i.e. Scenario B above). However, we have adjusted the inputs in Ofcom's model to include the cost to the CP relating to Openreach's PIA charges.[87] We therefore assume that the CP will need to deploy tubing, blow fibre, and provide the electronics, but will rent duct access using PIA. Conservatively we assume that the duct access is used for providing a single leased line. As set out above, CPs may be able to use DPA to aggregate circuits thereby benefitting from economies of scale and scope. We do not include any such economies in our analysis.

110 Ofcom's Scenario B cost stack includes items for:

- Survey;
- Blown fibre tubing;
- Blown fibre;
- Blockage clearance; and
- EAD electronics equipment and installation.

111 We retain each of these cost items and Ofcom's assumptions for each.[88] This is likely a conservative assumption for the scenario we are considering; we understand that under the changes to PIA introduced under the WLAMR 2018 MUDPA regime, Openreach will not charge CPs for blockage clearance from April 2019 if the costs of such activities are less than the £4,750 per km network adjustment limit set by Ofcom.

112 To reflect a CP using BT's PIA product rather than their own duct we have included the following additional items in the cost stack:

- **Lead-in duct**: although not used in its calculation, Ofcom's model contains an assumed lead-in length of 25m. We have used this assumed distance and applied the rate of 55p per metre per year (i.e. the highest lead-in rate) from BT's PIA price list[89].

86 Only making the minimum necessary changes to Ofcom's model should not interpreted as our agreement with all aspects of Ofcom's calculations. We have not subjected the model to a detailed methodology or input review. Rather our use of Ofcom's model is intended to illustrate the impact of taking DPA into account in a manner that maintains consistency with Ofcom's existing approach.

87 Consistent with Ofcom's approach (and therefore the prices for other services contained within the modelling) we have used the charges currently in force. However, these may be subject to change prior to the review period.

88 We also retain Ofcom's assumptions in relation the pricing of Openreach's wholesale Ethernet services. As such, for a seven-year circuits we use the Openreach 84-month term discount charges. These charges are higher than the 60-month term discount charges. In practice it is therefore unlikely that CPs will take out the 84-month term discount products. Rather CPs are likely to use the 60-month term discount product for all retail circuits sold for 5 years or longer. The use of the 84-month term discount charges is therefore conservative.

89 Although largely unused all the relevant PIA price lists are included in Ofcom's model.

- **Spine duct**: we assume that all duct that is not lead-in duct is single bore. We therefore, conservatively[90], apply the rate of 28p per metre per year from the PIA price list.

- **Joint box facility hosting**: we assume 32 joint boxes per kilometre[91] and a rate of £2.01 per box per year from the PIA price list. We understand that for every joint box there will be a charge into the box and out of the box, therefore the effective charge is £4.02 per box.

- **Distribution joint hosting**: we assume one distribution point (i.e. 'Customer Apparatus In-line Splice hosting and distribution joints') per circuit at the rate of £18.11 per year from the PIA price list.

- **Joint box breakthrough**: we assume that the CP will need to breakthrough from its duct into BT's duct. We use the 'Joint box breakthrough' charge (£566.35) on the PIA price list as a proxy for this cost.

113 We understand that Openreach currently has a minimum term for spine duct rental of five years, although the minimum term for other PIA products can be less. Conservatively, we assume that all PIA charges have a minimum five-year term and therefore include a minimum five years of PIA charges in our analysis.[92]

114 We treat each of these costs in an equivalent manner to Ofcom's original model. Therefore, costs that occur over time are discounted using the same discount rate used by Ofcom.

90 The charges for two or more bore spine duct are materially higher, hence why this is a conservative assumption.

91 Ofcom's modelling does not include assumptions on joint box hosting. We have therefore discussed with BT what a reasonable, but conservative, assumption could be for the purposes of our modelling. Based on these discussions, we have assumed 32.

92 i.e. 5 years of charges are included for 3- and 5-year TCOs, and 7 years of charges are included for 7-year TCOs.

A2 Overview of the BCMR 2019 and PIMR 2019 consultations

A2.1 PIMR 2019

115 The PIMR 2019 considers the upstream market for telecoms physical infrastructure and provides the legal basis for Ofcom to introduce UDPA.[93] Ofcom's key proposals on market definition and SMP are:

- **Single infrastructure product market**: Ofcom defines the market as the supply of access to telecoms physical infrastructure that comprises the ducts, poles and underground chambers used to supply fixed telecoms services.
- **Separate geographic markets**: Ofcom defines four geographic markets that mirror the markets defined in the BCMR 2019.
- **BT has SMP in all markets**: Ofcom finds that competition is not effective in all four geographic markets and hence that BT has SMP throughout the UK.

116 Ofcom explains that BT's SMP in the physical infrastructure market stems from its ability to deploy new fibre networks more flexibly, at lower cost, at greater speed, and with more extensive coverage and less risk than competitors who lack the advantage of BT's ubiquitous network. Absent regulation, Ofcom considers that BT would have the ability and incentive to distort downstream competition and/or harm consumers.[94]

117 Ofcom's analysis clearly indicates that it considers that BT's control of a ubiquitous physical telecoms infrastructure is the key bottleneck that underpins its SMP in infrastructure market and in downstream markets. This reflects the economic reality that building physical infrastructure involves large, risky, and sunk investments in civil infrastructure.

A2.2 BCMR 2019

118 The BCMR 2019 concerns the wholesale market for business connectivity services used to provide high capacity services used by businesses, mobile network operators and communications providers. This market is downstream from the physical infrastructure market since wholesale business connectivity services rely on physical infrastructure as an essential input.

119 Ofcom defines separate product markets for contemporary interface (CI) access services, and CI inter-exchange connectivity. We outline Ofcom's proposed findings in relation to product and geographic market definition, SMP and remedies for these markets below.

93 Since this market is not one of the markets identified in the 2014 EC Recommendation hence Ofcom must apply the three-criteria test to demonstrate that ex ante regulation is required. Ofcom states the physical infrastructure market is the most upstream wholesale market that is related to retail markets in which competition problems have been found. See PIMR 2019, para. 3.6.

94 For example, by refusing to supply access to its physical infrastructure, setting excessive wholesale prices or engaging in price squeezing, or discriminating against downstream rivals in favour of its own downstream businesses.

CI access service market

120 The CI access service market includes the wholesale supply of the connections to end-user business sites (e.g. office buildings or mobile base stations). These connections are provided at different bandwidths, with most circuits being at 100 Mbit/s, 1 Gbit/s, and 10 Gbit/s. Circuits with a bandwidth in excess of 1 Gbit/s are referred to as very high bandwidth ('VHB') circuits.

Product market definition

121 Ofcom proposes to define a single product market for CI access service that covers all bandwidths and includes all wholesale fibre Ethernet and WDM services used to connect end customers to fibre networks, as well as dark fibre used to supply CI access services. This is based on:

- Pricing evidence of chain of substitution with a potential break between 1 Gbit/s and VHB services.
- Ease of supply-side substitution across all bandwidths where suppliers already have a connection.
- Evidence that competitive conditions do not vary by bandwidth where there is no existing connection. This conclusion is based on evidence that the dig distance for network extensions is similar across bandwidths (based on self-build by CPs).

Geographic market definition

122 Ofcom's analysis of geographic markets is based an assessment of network reach in different postcode sectors. This involves the calculation of the number of telecoms providers other than BT that have network within reach of the business sites in each postcode sector.

- The network reach calculation is based on an estimate of the maximum dig distance (referred to as the 'buffer distance') that would be economic for a CP considering building a network extension from a flex point on its network to supply a site to which it is not connected.
- Ofcom uses a buffer distance of 50m that is based on its modelling of the economic dig distance based on the cost of self-build, and evidence of the actual dig distances observed.
- Ofcom assumes that a CP covers a postcode sector only if it is within the buffer distance and hence deemed able to supply at least 65% of the large business sites in the sector.

123 Based on its network reach analysis, Ofcom aggregates postcode sectors to define several separate geographic markets that reflect the presence of rival networks to BT. These are:

- BT only areas.
- BT+1 areas.
- HNR areas (BT+2) in Birmingham, Bristol, Edinburgh, Glasgow, Leeds and Manchester ('Metro areas').
- All other HNR (BT+2) areas in the rest of the UK (taken together).

- The Central London Area ('CLA').

SMP analysis

124 Ofcom proposes to find that BT has SMP in all geographic markets except the CLA.

125 In the BT only and BT+1 markets Ofcom explains that its SMP finding reflects BT's high service shares in excess of 50%, the limited availability of rival infrastructure close to customer sites, high barriers to entry and expansion, and the limited prospects for competition. In this regard, Ofcom states it considers any usage of DPA is unlikely to be widespread within the period of the BCMR 2019 review and therefore unlikely to result in effective competition by 2021.

126 In the Metro areas and the other HNR areas in the rest of the UK, Ofcom explains that its SMP finding reflects BT's high service share over 50%, evidence of BT's competitive advantage from being closer to a significant proportion of customer sites, BT's economies of scale and scope, high barriers to entry and expansion, and the limited prospects for potential competition.

Remedies

127 Ofcom proposes to implement remedies that vary by geographic market, in recognition of the variation in the degree of competition in different areas:

- BT only and BT+1 areas: Ofcom proposes to cap prices at their current level through a CPI-CPI control, and impose minimum quality of service standards at all bandwidths in BT only and BT+1 areas where there is no or limited competition.

- HNR areas (Metro and other BT+2 areas): Ofcom proposes lighter remedies in these areas with a requirement to provide network access at fair and reasonable prices, instead of a charge control, and no minimum quality standards.

128 Ofcom states that the lighter touch remedies in the HNR areas where there is already some competition take into account that unrestricted DPA is likely to become available during the review period.[95]

CI inter-exchange connectivity market

129 The CI inter-exchange connectivity market considers the connections between BT exchanges in different geographic markets. These comprise both backhaul connections between BT exchanges that serve as access aggregation nodes and core nodes, as well as core connections between exchanges that serve as core nodes. These leased line connections are important for fixed broadband operators such as Sky and Talk Talk as they are needed to backhaul broadband traffic from BT exchanges where they have equipment to their core networks.

Product and geographic market definition

130 As in the CI access services market, Ofcom proposes to define a single product market that includes all bandwidths on the basis of ease of supply-side substitution where a telecoms provider

[95] BCMR 2019, para. 10.30.

has an existing connection to the BT exchange. Ofcom considers that the conditions of competition vary at each exchange and proposes to define each BT exchange as a separate geographic market.

SMP analysis

131 In relation to SMP, Ofcom proposes to find that BT has SMP at all BT only exchanges, on the basis that there is a de facto monopoly at these exchanges, and it would not be economic for other operators to extend their networks to the vast majority of BT only exchanges, given the distances involved.

132 Similarly, Ofcom proposes to find that BT has SMP at all BT+1 exchanges where it faces competition from fewer than two other Principal Core Operators.[96] It argues that the presence of one rival network is not sufficient to ensure effective competition, and that it would also not be economic for other CPs to extend their networks to these exchanges.

Remedies

133 As in the CI access services market, Ofcom proposes to implement remedies that vary by geographic market with a requirement for BT to provide access to dark fibre at cost for connections from BT only exchanges, but not BT+1 exchanges.

134 Ofcom explains that this variation in remedies reflects the fact that it is confident that network competition is unlikely to develop in BT only exchanges as a result of DPA in the medium to long term.[97] However, Ofcom does not provide any detailed supporting analysis.

[96] To be classified as a Principal Core Operator, a telecoms provider must own its own fibre network, have a substantial footprint, and have capacity to offer wholesale inter-exchange connectivity. BCMR 2019, footnote 163.

[97] BCMR 2019, para. 10.15.


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