[NON-CONFIDENTIAL VERSION]

Response to Ofcom's Dark Fibre consultation

Consultation on adding dark fibre to the remedies for business connectivity markets

Joint submission by Colt, TalkTalk, Sky and Vodafone (the 'Passive Access Group')

29 December 2017

Contents

Executive Summary

1. This is a joint consultation response submitted jointly by Colt, Sky, TalkTalk and Vodafone (the 'Passive Access Group' ('PAG')).

2. This response is made in support of the measures Ofcom has introduced in the Temporary Conditions statement in response to the regulatory lacuna created by BT's appeal of the 2016 BCMR and Ofcom's proposal in its 23 November consultation to introduce a dark fibre access ('DFA') remedy until March 2019 ('Temporary Measures').

3. The PAG was established because of the group members' shared view that passive remedies in general, but in particular dark fibre, are essential to promote competition in the business connectivity market. Representing of some of the largest providers of fixed, mobile, public and private network operators in the UK, the PAG members are some of the largest consumers of business connectivity products and services (in particular, active circuits) from BT and are therefore the most likely users of dark fibre.

4. The PAG has made a number of submissions to Ofcom throughout the 2016 BCMR administrative phase, and more recently to the 2017 Wholesale Local Access Market Review consultations in support of dark fibre and duct and pole access. PAG members also intervened in support of Ofcom (against BT) in BT's appeal of the 2016 BCMR. The PAG members' submissions focussed materially on the benefits and use cases of and demand for passive remedies to be imposed on BT, including unrestricted dark fibre and duct and pole access. Please do not hesitate to let us know if you would like to us to provide any of these previous responses.

5. This submission is targeted at the questions in Ofcom's Dark Fibre consultation document of 23 November 2017 that apply generally to the PAG. Each PAG member will also be providing their own responses directly to Ofcom covering issues that are specific to them. This response draws together evidence of demand and use cases for dark fibre from the PAG and provides some views on the likely impacts of the Temporary Measures from the PAG's collective experience. We emphasise the following headline points:

   (a) The PAG fully supports Ofcom's decision to make temporary market identifications, market power determinations and impose temporary SMP conditions and directions on BT to address BT's ability and incentive to abuse its SMP in the markets for CISBO products with speeds at or below 1Gbit/s. We consider it was proportionate and appropriate for Ofcom to use its section 80 powers in these circumstances.

   (b) There is significant demand from PAG members to purchase dark fibre, including for providing active circuits up to and including 1Gbit/s which is set to become the fastest growing and significant segment of the market over the review period. In addition, growth in bandwidth demand remains steady and forecasts are that demand for circuits above 1Gbit/s is growing steadily.

   (c) The PAG supports Ofcom's proposal to introduce dark fibre in the interim between April 2018 and March 2019. The UK is in desperate need of passive remedies to meet the

bandwidth demands of the economy and if it is to keep pace with comparative economies. Any dark fibre remedy that Ofcom can offer at this time is therefore welcome. Given the growth in demand for bandwidth for circuits above 1Gbit/s Ofcom should remove any restrictions on CPs providing circuits above 1Gbit/s at the earliest opportunity. The PAG believes dark fibre is part of the much-needed next step in promoting investment in infrastructure based competition and fibre in the UK.

6. Comments made in this response should be read against the PAG's general position that usage restrictions can be harmful to competition and should not be imposed under normal circumstances. We encourage Ofcom to commit to reconsidering removing the restrictions as part of the next BCMR, which should be concluded by April 2019.

7. We note that the PAG's support for the Temporary Measures does not resolve our concerns about the current active minus DFA costing methodology. The PAG considers that a cost-based methodology would be superior to the current pricing approach, and would promote more intense competition while still ensuring that BT has the opportunity to recover its costs. The PAG has provided some thoughts on Ofcom's approach to pricing dark fibre in section 5. We strongly urge Ofcom to re-consider its DFA pricing methodology preference and opt for a cost-plus approach pricing methodology for DFA in the next price control period.

There is significant demand for dark fibre

Question 4.5 Do you agree that we should impose dark fibre remedy for the period April 2018 to March 2019? Please set out your reasons and supporting evidence for your response.

Question 5.1 Do you agree with our forecast for dark fibre take-up in 2018/2019? Please set out your reasons and supporting evidence for your response, including any volume forecasts you have for consumption of dark fibre 2018/19?

Question 3.2: If BT were to make available a dark fibre product based on the design set out above, how long would it take before your company was in a position to purchase it? From what date would you want BT to make such a product available?

There is compelling evidence for demand for bandwidth up to and including 1Gbit/s

8. The PAG are some of the largest purchasers of active circuits from BT. As set out in further detail in the 'Assessment of the benefits of dark fibre' section, CP purchasers of active circuits are the most likely candidate purchasers of dark fibre. DFA provides CPs with greater control over the network elements and enables competition with BT and other infrastructure providers at a deeper level of the access infrastructure to deliver better circuits more efficiently to themselves, to their customers and ultimately end-users and consumers. Evidence of increasing bandwidth demand by CPs can therefore be taken as a good proxy for demand for dark fibre.

9. Each PAG member has provided demand forecasts and use cases to Ofcom as part of the 2016 BCMR administrative phase which are by and large still relevant to the newly designed dark fibre remedy. The PAG also provides further support below for significant demand for circuits up to and above 1Gbit/s and for dark fibre in the form of use cases, forecasts and projections from Vodafone, Colt, Sky and TalkTalk.

10. We recognise that while BT will demand obvious 'evidence' of demand before any regulatory remedy can be introduced, the PAG remains of the view however that evidence of demand is not *necessarily* required to underpin a regulatory decision of whether to implement any particular remedy. The most well-known example of where current demand bears little to no reflection of immediately obvious evidence of 'substantial demand' is in relation to LLU in the late 1990s. LLU helped create demand and has since become widely used and has played a central role in shaping the fixed access market that exists today.

11. As previously indicated, demand for DFA will increase steadily over time as customers and CPs themselves develop more use cases once dark fibre is seen to work in practice, and as bandwidth demand continues to increase. As with the original 2016 BCMR remedy, widespread take up will inevitably not be immediate

12. One reason for this is that Ofcom, BT and industry recognised that BT (and industry) need time to work out the details of the service level agreements ('SLAs) and service level guarantees ('SLGs') associated with DFA. This includes working through testing and agreeing forecasts, which is why it was accepted that BT should have 6-months to implement SLAs/SLGs after the DFA launch date. As a consequence, there will be some unavoidable 'demand-lag' for DFA from some customers until SLAs/SLGs are implemented. Given the potential harm that could occur if

BT failed to implement SLA/SLGs we do encourage Ofcom to make the 6-month deadline of 1 October 2018 a hard legal backstop by including it as a requirement of the SMP condition.

13. In the event an unrestricted remedy is introduced in 2019, these kind of issues which caused ‘demand lag’ initially will be resolved by that time, which will provide for smoother and quicker initial take up if an unrestricted DFA remedy is introduced.

14. In the follow up to the launch of the dark fibre remedy in October 2018 members of the PAG forecasted their DFA orders:

Vodafone

(a) **[CONFIDENTIAL TO VODAFONE]**: ✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂ ✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂ ✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂ ✂✂✂✂✂✂✂✂✂✂✂].

(b) Vodafone submitted evidence to the CAT showing that it forecast significant and steady increases in demand for bandwidth up to and over 1Gbit/s. Research Vodafone commissioned from Ovum, set out in the table below, shows slower growth in demand for sub-1Gbit/s Ethernet services and very significant growth in services of 1Gbit/s and above.

Table

[CONFIDENTIAL TO VODAFONE]: ✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂ ✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂ ✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂ ✂✂✂✂✂].

Source:

(c) Vodafone itself uses high bandwidth (at or above 1Gbit/s) circuits in a number of scenarios:

i. To provide retail enterprise solutions to enterprise customers: this includes multi-national corporations active in the UK, large UK corporations, government agencies and departments, small and medium enterprises (‘SMEs’), and small office/home office (‘SOHO’) customers.

ii. To provide connectivity solutions to other CPs (wholesale customers solutions) through Vodafone’s Carrier Services (‘VCS’) division.

iii. Mobile backhaul: To connect radio masts (cell towers) to Vodafone’s core network. Vodafone’s Mobile Networks team is responsible for procuring access circuits for use in Vodafone’s mobile backhaul network.

iv. Access backhaul from local exchanges to Vodafone's fixed network: To provide access backhaul from BT's local exchanges to Vodafone's network via Vodafone's Fixed Networks team.

15. Vodafone notes it is no longer the case that it is only CPs that are demanding 1Gbit/s or more for backhaul. Vodafone has seen significant growth in demand from enterprise customers requiring access circuits at and above 1Gbit/s in recent times. Vodafone's internal data shows that circuit demand is now moving to a new standard bandwidth of 1Gbit/s and a slowdown in growth for circuits below 1Gbit/s.

TABLE – CONFIDENTIAL TO VODAFONE

[redacted]

Note: VCS = Vodafone carrier services; VGE = Vodafone Global Enterprises; VUK = Vodafone United Kingdom

TalkTalk

16. [**CONFIDENTIAL TO TALKTALK**]: [redacted].]

[CONFIDENTIAL: Figure 2 BT Openreach EAD Rentals and Gross Connection by capacity 2013-2016]

[redacted]

Source: [redacted]

17. [**CONFIDENTIAL TO TALKTALK**] [redacted].

CONFIDENTIAL: Total UK Ethernet Connection by Capacity 2016-2020

[redacted]

[redacted]

18. [redacted].

SLIDE: **CONFIDENTIAL TO TALKTALK**

[redacted]

19. [**CONFIDENTIAL TALKTALK**]: [redacted].

20. The table below show the capacity upgrade path of a typical TalkTalk exchange, CMBIL is Bilston, and CMWIL is Willenhall. This is modelled to provide optimal capacity given the expected relative prices of 1Gbit/s and 10Gbit/s circuits, and was developed when TalkTalk was creating its internal business case for using dark fibre.

[CONFIDENTIAL TALKTALK: Table]

[redacted]

Colt

21. [redacted]. As part of that exercise, it also

obtained some forecasts from Ovum. The forecasts relate to the number of Ethernet connections in the UK, between 2013 and 2020.

TABLE: CONFIDENTIAL TO COLT

[redacted]

22. [redacted].

Sky

23. **[CONFIDENTIAL TO SKY]** [redacted]:

(a) [redacted].

(b) [redacted].

24. [redacted]:

(a) [redacted];

(b) [redacted]

(c) [redacted].

25. [redacted]

[redacted].

26. The PAG is aware that Ofcom already has a significant amount of evidence showing demand at or below 1Gbit/s consistent with the data above from the PAG. From the 2016 BDRC survey, Ofcom concluded that: "*Evidence shows that dark fibre use is not limited to VHB services. We asked end-users on the types of connection speeds they have over dark fibre. Out of a sample of 120 dark fibre circuits, 10Gbit/s was the most popular connection rate, however, around 23% of the circuits were used for a single 1Gbit/s*"[1]. In our view the survey results underplay the benefits and consequential demand of DFA at 1Gbit/s in terms of cost savings that can be realised wit service provision benefits.

27. As cited above the steady growth in bandwidth demand means that demand for 1Gbit/s circuits will become the largest market segment over the next 12-18 months. This demand for 1Gbit/ circuits translates almost frictionlessly into demand from CPs for dark fibre to self-supply those active circuits themselves. This evidence of bandwidth demand therefore strongly supports take up of the dark fibre remedy for use by CPs to supply 1Gbit/s circuits.

Demand for bandwidth above 1Gbit/s is also increasing

28. We have emphasised the evidence of demand for dark fibre at and below 1Gbit/s because Ofcom's proposed remedy in this consultation is limited to these bandwidth segments. Yet, this is not because there is no demand above 1Gbit/s. The PAG has previously provided evidence to Ofcom showing that demand for higher bandwidth circuits above 1Gbit/s is present.[2]

29. This upward trend in demand for higher circuit speeds is the result of data usage growing rapidly, driving demand for higher bandwidth capacity and speed. Amongst enterprise customers, demand for bandwidth is increasing as more operations are digitised and IT systems become increasingly capable of manipulating more and more graphical data. To keep up with this trend, CPs need to update backhaul networks which now generally require upgrading to speeds above 1Gbit/s in order to increase available aggregate capacity in their IP transit and BT exchange backhaul capabilities. [**CONFIDENTIAL TO VODAFONE:** [redacted].]

30. Data use is also being driven by services such as video calling and content streaming via platforms. Consumer demand for more data is driving demand for higher speed mobile backhaul. For this purpose [[**CONFIDENTIAL TO** [redacted]]

31. As part of the BCMR appeal, the PAG supported Ofcom with some members intervening, and submitted evidence of demand for higher bandwidth and the ability to provide choice to the

[1] BCMR Statement 2016 (Volume 1), paragraph 4.291.
[2] For example, in the BCMR 2016 administrative phase and consultation responses and the BCMR appeal 2016.

end-customer through dark fibre. The evidence shows that the market is highly dynamic and moving towards higher bandwidth services for both price and non-price reasons.

32. A member of the PAG [**CONFIDENTIAL**: ✂] collected historic data on number of new orders to show how demand for connections of different bandwidth has evolved over time. The data, which covers all countries served by this CP [**CONFIDENTIAL:** ✂] showed that demand between 100 Mbit/s and 10 Gbit/s had increased from [**CONFIDENTIAL:** ✂%] of all orders in 2013-2014 to [**CONFIDENTIAL:** ✂%] of all orders from 2015 to 2016.

33. TalkTalk has shown Ofcom that demand for bandwidth across its network is projected to [**CONFIDENTIAL TO TALKTALK**: ✂] in the four years from FY17, driven by demand for retail products. TalkTalk expects migration to 10Gbit/s EAD services to be particularly pronounced if prices for 10Gbit/s and higher services are reduced to be closer to the underlying costs of supply.

[**CONFIDENTIAL TO TALKTALK**: TalkTalk table. Note: Units are in number of circuits rather than aggregate capacity.]

✂

34. [**CONFIDENTIAL TO VODAFONE**] ✂.

35. While the PAG welcomes Ofcom's proposal to introduce a dark fibre remedy up to and including at 1Gbit/s, there is compelling evidence of significant demand from CPs to supply both themselves and their customers with 10Gbit/s circuits. Given the steady upward growth in demand we strongly encourage Ofcom to swiftly provide solid plans to lift the restriction as soon as possible, as supply of 10Gbit/s becomes the 'new norm' over the next 3 to 5 years.

Market Assessment

Question 2.1: Do you agree with our findings in relation to product market Question 2.1: Do you agree with our findings in relation to product market definition as set out in paragraphs 2.9 to 2.13 of the BCMR Temporary Conditions Statement, namely that we define a market comprising wholesale leased line services of all bandwidths at and below 1Gbit/s using contemporary interface (CI) technologies, including EFM? Please set out your reasons and supporting evidence for your response. Question 2.2: Do you agree with our findings in relation to geographic market definition as set out in paragraphs 2.14 to 2.19 of the BCMR Temporary Conditions Statement, namely that we define the following geographic markets: (a) the CLA; (b) the LP; (c) the CBDs of each of Birmingham, Bristol, Leeds, Glasgow and Manchester; and (d) the RoUK excluding the Five CBDs? Please set out your reasons and supporting evidence for your response.

Question 2.4: Do you agree with our findings that BT has SMP in the markets for Lower Bandwidth CISBO services in the LP, the CBDs of each of Bristol and Manchester and the RoUK excluding the Five CBDs, up to the end of March 2019, as set out in paragraphs 2.20 to 2.100 of the BCMR Temporary Conditions Statement? Please set out your reasons and supporting evidence for your response.

36. The PAG supports Ofcom's approach to product and geographic market definition in paragraphs 2.9 to 2.19 of the BCMR Temporary Conditions Statement ('Temporary Framework') for the purpose of addressing the market definition issues identified in the Judgment and the Temporary Framework. Our principal reason is the PAG agreed and still agrees with Ofcom's SMP findings in the 2016 BCMR statement that BT has SMP in all CISBO services (including above 1Gbit/s) and in the Rest of UK including the CBDs.

37. The PAG provided significant evidence to Ofcom during the administrative phase supporting Ofcom's geographic and product market definition findings in relation to BT's SMP. Ofcom has taken an extremely cautious approach to finding SMP across products and geographies when setting the Temporary Framework. We consider there is no reason or basis to diverge from the 2016 BCMR statement except for the specific parts of the Statement that were affected by BT's appeal. We recognise that Ofcom needed to act swiftly to put the Temporary Framework in place to protect competition and consumers. We are confident that Ofcom will find greater levels of SMP in its conclusions in BCMR 2019.

38. The PAG does not consider it is actually necessary for Ofcom to consult on the Temporary Framework at all. It is, by its nature, in the very specific wording of section 80A(2) that the requirement for domestic consultation 'does not apply'. The PAG also considers the Temporary Framework adopted by Ofcom is proportionate, if not conservative, in all respects. In particular, we note BT's grounds of appeal with respect to product market was that '*Ofcom erred in its analysis of demand and supply side substitutability between 1Gb and VHB*'. BT did not challenge Ofcom's SMP finding at or below 1Gbit/s. There is no basis for BT to now argue or for Ofcom or the Tribunal to find differently and throw out 'the baby with the bathwater' in relation to SMP remedies for services at or below 1Gbit/s.

39. The PAG reserves its position on any future approach to product and geographic market assessment by Ofcom.

Assessment of the benefits of Dark Fibre

Question 4.1: Do you agree with our assessment of the benefits of our proposed dark fibre remedy? Please set out your reasons and supporting evidence for your response.

Question 4.2: Do you have evidence on the current relative prevalence of each scenario of active equipment configurations as shown in Figures 4.1 and Figure 4.2? Please set out your reasons and supporting evidence for your response

40. Ofcom found in its Digital Communications Review that the best driver of investment and innovation is network based competition[3] and in the 2016 BCMR Statement that dark fibre was the best way of achieving this in business connectivity markets.[4] Dark fibre is particularly effective in enabling new business services and functionality, which can fuel economic growth, help boost employment and enable prosperity. Markets with dark fibre access promote investment deeper in Openreach's network, or in competing infrastructure-based networks, leading to opportunities for first mover advantages through innovation and service differentiation, and rollout of services to unserved areas, with clear benefits for business customers and ultimately consumers.

41. Precise benefits and use cases for any potential regulatory remedy are, by their nature, partly speculative and cannot be straightforwardly or comprehensively identified in advance. Businesses naturally do not spend significant time and effort developing business plans for inputs that may or may not be introduced. Nevertheless, as above, some PAG members already operate in other non-UK markets using dark fibre and duct and all members are able to develop potential use cases for dark fibre in the UK given the many and varied problems encountered by relying on Openreach's active products. The PAG is therefore extremely well placed to provide Ofcom with solid evidence and examples for what they expect dark fibre to be used for and the benefits that they expect it will bring.

42. What is clear from international experience and technology coming onto the market is that dark fibre has the potential to unlock game changing innovations that are likely to have profound impacts on society. These innovations rely significantly on communications networks being able to deliver high bandwidth speeds and ultra-low latencies. Higher speeds and ultra-low latency services can facilitate new ways for businesses to operate, streamline their processes and make better use of their assets.

43. The market drivers supporting the trend towards higher bandwidths are clear, well understood, and include the following:

    (a) Increased data usage by end-users (e.g. fixed and mobile broadband), requiring far higher capacity backhaul connections;

    (b) Increased adoption of e-commerce platforms for interacting with customers and suppliers;

[3] 4.12.
[4] A18.4

(c) Increased adoption of cloud based data services, requiring higher capacity connections to data centres;

(d) Increased adoption of bandwidth intensive applications such as streaming video and video conferencing.

44. The full control over active equipment offered by dark fibre enables mobile providers to apply innovations to make automated, intelligent decisions about technical issues such as how to route traffic and enable cellular and WIFI technology, which improves customer experience. Known as Cloud Radio Access Network or "C- RAN", it cannot be provided over Openreach Ethernet or WDM.

45. The relationship between high speed, low latency networks illustrates an important point of principle: given the interdependencies between communications networks and the many and varied technological advancements occurring recently, it would be superficial (and have potentially perverse results) to ignore the relationship between derived demand for network speed, latency capability, innovation and technological advancement.

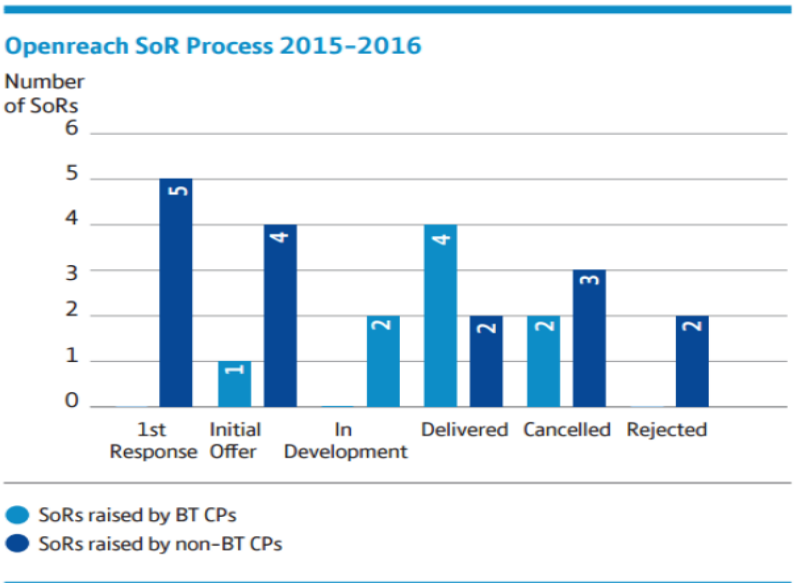
46. The current active service offering from BT/Openreach cannot deliver the type of ultra-low latency features required and so stifles innovation that relies on it. Giving CPs the ability to control, test and manage the service from end-to-end can do so. CPs stand ready to respond to customer demand through the greater control over equipment innovation that dark fibre provides. Innovation driven by derived demand, and derived demand itself, strongly supports an assessment that dark fibre will also increase innovation in other technologies and markets.

47. BT's Statement of Requirement ('SoR') process, the process designed by BT by which CPs may request Openreach to develop innovations on the active services they purchase, requires CP requests to 'pass' a non-transparent, inherently subjective test in order to convince Openreach to invest in any particular innovation - this is particularly important where the innovation may not provide any benefit to BT's downstream divisions.

48. By its nature dark fibre enables CPs to innovate with active services beyond the very slow pace of the SoR process. As Ofcom indicates, BT's SoR process requires CPs to notify BT (their supplier) and their competitors (including BT downstream divisions) of the product innovations they would like BT to develop on their behalf. This naturally disincentivises and stifles innovation since the requesting CP is unable to gain any first mover advantage.

49. BT's Equality of Access Board ('EAB') (the body that monitors BT's compliance with its Undertakings) monitors the SoR process annually. The following graph is from the 2016 EAB report:[5]

[5] 2016 EAB report, page 20. Available at: https://www.btplc.com/Thegroup/Ourcompany/Theboard/Boardcommittees/EqualityofAccessBoard/Publications/EAB_Annual_Report_2016.pdf.



50. The EAB's 2016 report shows that BT delivered four of its own requests that were progressed using the SoR procedure and is progressing a further two. By contrast, BT only progressed two of the SoR requests that it has received from its customers across the entire telecommunications industry.

51. Dark fibre allows CPs to connect any equipment they choose and to use equipment that better suits their customers' needs. It also enables demand signals to be passed more efficiently through to their equipment suppliers. On the other hand, Openreach's EAD products are tied to the equipment Openreach has decided it will supply with its products based on its business case justifications, whether CPs and their customers like it or not.

52. The PAG considers that theoretical economic benefits of dark fibre remain valid as stated in the PAG's submissions to Ofcom provided as part of Ofcom's November 2014 Preliminary consultation on passive remedies, and each of the PAG members' individual submissions to the 2015 BCMR consultation.

53. The PAG members have individually submitted evidence of the different use cases for dark fibre to demonstrate the benefits of dark fibre apply across a range of applications and that as Ofcom admits '*undue restrictions in product use may reduce the benefit of dark fibre*'. These are summarised below:

Colt

54. Colt considers that the construction of new fibre networks covering broad areas such as city centres and outlying business parks would be the primary application of passive remedies. Once in place, fibre networks can be used for any purpose including business connectivity and backhaul:

    (a) Colt considers that if left entirely to BT, many innovation improvements would never see the light of day (or would only do so with a significant delay). These include those around Quality of Service (QoS) (such as certainty of service delivery date, lead times and

customer communications), fault management, bandwidth scalability, network performance monitoring, and latency.

(b) Colt sells a scalable bandwidth product that allows customers to adjust their bandwidth dynamically, that is, almost in real-time and at very low transaction cost. At present, Colt can only sell this product to customers directly connected to its own fibre. If BT were to provide dark fibre as a wholesale product, due to its network ubiquity, Colt would be able to offer this innovation to a far greater number of customers than is possible today.

(c) Customers who require connections at multiple sites provide a good example of the benefits of dark fibre in promoting bandwidth scalability. Suppose a given customer buys a private network (a network that it has exclusive use of and security of access control) from Colt, with one end connected to Colt fibre and the other connected to an Openreach EAD circuit, and that customer requires a temporary bandwidth upgrade across their entire network. This would easily be possible on the end connected to Colt's fibre but would not be realistically possible on the Openreach end because it would require a complex and costly upgrade (such as new equipment and a cease and re-provide and possibly early termination charges). The result is that the customer would not have an upgradeable service in any seamless or cost free manner. On the other hand, if Colt could substitute the Openreach circuit with dark fibre, Colt would have full control of the upgrade, which would be seamless and almost costless from the customer's point of view.

Sky

55. Sky identified three specific usage cases: for FTTP network deployment; LLU/NGA backhaul; and mixed usage of duct, poles, and of dark fibre. Sky considers that unconstrained remedies will allow CPs to develop a broad suite of services in order to maximise the scale and scope efficiencies of their investment using passive access.

56. [**CONFIDENTIAL TO SKY]** ✂✂ ✂✂ ✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂.]

Vodafone

57. Vodafone currently offers a very high quality, low latency Dedicated Ethernet service whereby connectivity between customer sites is over a single (dedicated) point-to-point circuit – e.g. between data centres or between a data centre and a head office. Vodafone's dedicated Ethernet currently follows BT's increments in bandwidths of 100Mbit/s, 1Gbit/s, 10Gbit/s and 100Gbit/s only, **[CONFIDENTIAL TO VODAFONE]**: ✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂✂].

58. All of Vodafone's other high-end products currently allow retail customers to purchase connectivity in small increments of bandwidth, up to the maximum bandwidth that the underlying access circuit is capable of supporting. For example, a customer who purchases an IP-VPN solution may purchase bandwidth services in increments of 1Mbit/s (e.g. 1, 2, 3Mbit/s),

in increments of 10Mbit/s (e.g. 10, 20, 30Mbit/s), in increments of 100Mbit/s (e.g. 100, 200, 300Mbit/s) or in increments of 1Gbit/s, up to a maximum of 10Gbit/s.

59. Vodafone sells high-end enterprise services to allow customers to increase or decrease their bandwidth flexibly at short notice or increase their bandwidth in "bursts" autonomously to varying degrees. Similarly, Vodafone also sells services to enterprise customers based on a far more customer responsive level of bandwidth demand than BT's rigid and artificial service gradient permits (10Mbit/s, 100Mbit/s, 1Gbit/s etc). Vodafone does this by 'throttling back' providing a 300Mbit/s service over a 1Gbit/s access circuit or to provide a 7Gbit/s service over a 10Gbit/s access circuit.

60. In fact, Vodafone states that it is common for its retail customers to specify bandwidth services in increments between the speeds offered by BT – i.e. in accordance with their own needs, and without any reference to BT's product portfolio (1Gbit/s or 10Gbit/s). As such, BT's claim that there is a break in the chain of substitution between different Ethernet and WDM products above and below 1Gbit/s, is misguided and incorrect. The appearance of such a break appears to simply be a product of BT's own product offerings and pricing decisions.

61. While Vodafone can respond to demand for these services to a degree at present using its own on-net network, the greater control and flexibility offered by dark fibre will allow Vodafone to use dark fibre to provide the benefits referred to above across BT's network and respond to the needs of a much wider customer base.

62. **[CONFIDENTIAL TO VODAFONE]** [redacted]

63. [redacted]

64. [redacted]

65. [redacted]

66. [redacted]

67. [redacted]:

(a) [redacted].

(b) [redacted].]

TalkTalk

68. TalkTalk considered that the initial focus of dark fibre would be both for backhaul and access for higher capacity circuits but, over time, TalkTalk expected that dark fibre will be used more widely. This is because "[t]he innovation, flexibility and electronics cost reduction opportunities are sufficient such that even if Openreach rebalanced its Ethernet prices […] then using dark fibre would be still attractive over the full range of active products and across all geographies."

69. TalkTalk agrees that Ofcom does not needs to identify specific innovations that will occur as a result of passive remedies.

70. If CPs are given the freedom to innovate at the active layer through dark fibre they may gain first mover advantages from this and so there will be stronger competition across a wider variety of services and in turn more incentives to innovate further. Ultimately consumers will benefit from this. When Openreach is relied on to 'innovate' no CP is able to enjoy a first mover advantage since Openreach is obliged to provide access to the innovation at the same time to all CPs (under EOI obligations).

71. Some of the different innovations and improvements that are likely to occur through dark fibre include:

(a) new pricing structures and pricing innovations such as: usage based tariffs; burstable speeds; 'pre-upgrade'; contract terms; minimum term; balance of connection and rental.

(b) process and quality innovations such as a lower fault rate and/or more rapid repair of faults in active equipment through for instance: more reliable equipment; better monitoring and proactive maintenance; hot standby[6]; better fault handling; more engineers; added resilience. These benefits could be significant since, according to the BT the majority (around two thirds) of faults on active circuits occur in the active layer. CPs could see significant quality of service improvements if they were within their domain to manage. Further, there will be some quality benefits in provisioning from introducing dark fibre remedies since provisioning of the active layer will be competitive.

72. CPs other than PAG members have also identified various use cases for dark fibre for under 1Gbit/s. In its response to the passive remedies consultation GTC identified that it would use dark fibre "for the purpose of connecting new local networks constructed by OCPs (either from pure housing developments, or from mixed-use developments) to core backhaul networks."

[6] Hot standby is where CPs have spare equipment on site ready to move in if the existing piece of equipment fails. This can't be done with an Openreach active product because CPs aren't allowed to touch BT's equipment/box.

73. TalkTalk have also identified the benefits of supplying customers using dark fibre in the past. Apart from TalkTalk being able to control its own costs of supplying to its customers, there are several pro-competitive and pro-customer benefits of connecting customers with dark fibre (irrespective of who supplies the dark fibre). In summary the benefits are as follow:

(a) CPs which use dark fibre can install NTE of their own choosing, and enable new functionality over the NTE in creative ways.

(b) It can be cheaper to migrate customers to higher access bearers over dark fibre where Vodafone owns the NTE than to migrate customers to higher capacity active Ethernet and WDM circuits supplied by BT.

(c) CPs which use dark fibre as inputs to provide products to their retail customers are not constrained by the technical restrictions that Openreach places on its wholesale active Ethernet and WDM products.

(d) CPs which use dark fibre are spared the time, effort and anti-innovative effects of asking BT to unlock features that it has blocked on its existing NTE or to make more innovative wholesale features available using BT's existing statement of requirements.

Design of the Dark Fibre Access remedy

3.1 Do you agree with our proposed design of the dark fibre access remedy? Please set out your reasons and supporting evidence for your response 3.2 Do you agree with our view, as expressed in paragraph 4.27, that situations where cost savings to providers

74. The PAG supports Ofcom's design of the temporary dark fibre access remedy for the purposes of the Temporary Conditions statement. The PAG has shown there is significant evidence of demand for dark fibre to supply circuits up to 1Gbit/s and so there is clearly enough demand for Ofcom to take this forward.

75. Importantly, the product launch needs to get underway as soon as possible so the SLAs/SLGs are resolved in the next 6 months and the market moves forward without further delay to the full availability of a mass market application product in Oct/Nov 2018. Further delay implementing a dark fibre remedy will have the knock on effect of further delaying the product development SLA/SLG refinement stage even further.

76. The PAG recognises that, in view of the outcome of the appeal and the Judgment, Ofcom considered it needed to impose a usage restriction. Generally however, like Ofcom, the PAG does not agree that blanket usage restrictions are positive for competition or promoting investment. Restricting use to below 1Gbit/s is unlikely to be a sustainable for CPs' business cases beyond the purposes of the Temporary Measures period of early 2019 given projected bandwidth growth in demand beyond 1Gbit/s after then. We strongly encourage Ofcom to act swiftly to put the dark fibre remedy it has proposed in place in the short term and re-instate the full unrestricted dark fibre remedy as soon as possible.

77. The PAG expects the critical next steps of getting the dark fibre remedy in place is to include ensuring that BT's reference offer is amended to reflect the scope of the remittal resulting from the Judgment fairly and reasonably. The PAG considers that a necessary step is for BT to once again work closely with industry on the reference offer amendments and the PAG is eager to assist with this. We also strongly encourage Ofcom to encourage BT to cooperate with industry in this regard, which may include that Ofcom attends meetings with industry and keeps a watching brief over the process to avoid potential disputes.

78. We think it would be of assistance if Ofcom would provide a commitment to considering removing the restrictions as part of the next BCMR, which should be concluded by April 2019.

Ofcom's approach to pricing

79. In line with Ofcom's approach in the 2016 BCMR Statement, Ofcom proposes that dark fibre be subject to a 'basis of charges' obligation with prices calculated on an 'active-minus' basis.

80. This approach will allow BT to set the margin between dark fibre and its active services on the basis of: (i) the LRIC avoided by BT when providing dark fibre; (ii) a deduction to reflect an estimate of non-domestic rates ('NDRs') of the CP lighting the fibre; and (iii) the LRIC of any

differences between dark fibre and the corresponding active services, complemented by guidance. Ofcom also notes that it will publish guidance relating to how it calculates the LRIC of the active elements.

81. The PAG recognises that, in the circumstances, the most appropriate pricing option for Ofcom to impose during the period of Temporary Measures may be its proposed active-minus pricing methodology given this has already been developed and is now understood by BT and industry – hence providing regulatory certainty over this review period.

82. However, the PAG does not consider that active-minus pricing is appropriate for dark fibre over the next BCMR review period and/or when the Temporary Measures come to an end (whichever is sooner). The PAG considers that at the next opportunity Ofcom should set the price of dark fibre access on a cost based 'cost-plus' methodology.

83. Cost-plus pricing is a clearly superior pricing methodology to active minus pricing in a number of respects and will better achieve Ofcom's objectives for competition and consumers:

    (a) First, active-minus pricing means that purchasing dark fibre will only permit CPs to contest part of the active circuit market with BT. This is because active minus pricing requires Ofcom to choose a reference active product to 'peg' the 'minus' component to; in this case it is BT's 1Gbit/s EAD price. On the basis that the starting price for dark fibre is approximately equal to the 1Gbit/s active price, CPs are foreclosed from competing with BT for the segment of the active circuit market under 1Gbit/s which is priced lower than 1Gbit/s.

    Preventing CPs from competing with BT for this segment will mean that they cannot benefit from the same economies of scale and scope as BT, reducing the intensity of competition. As the sub 1Gbit/s market is forecast (including by Ofcom) to still be the largest segment of the market by early 2019 - the end of the 2016 BCMR charge control period and the beginning of the new control a significant proportion of the market will not be available to competition until Ofcom 'releases' it by moving to a better methodology, which is, in our view, a cost-plus approach.

    (b) Second, because Ofcom uses LRIC instead of 'LRIC plus' as the 'minus', no contribution to common costs is deducted where a CP switches from an active BT product to dark fibre. This may well have the effect of distorting competition including because when an active circuit is 'lost' to BT through competition by a rival using dark fibre, BT will not suffer any reduction in the contribution to its common costs in that scenario.

    (c) Third, active-minus pricing suffers from a lack of transparency. This is because, although Ofcom provides BT with guidance on how prices should be set, BT sets the margin between active and passive services using data that is not available to CPs. Though Ofcom will monitor this by determining disputes, this is not efficient due to the cost and time disputes take to resolve and so may reduce investment levels in dark fibre. Further, BT will have no incentive to set efficient prices under Ofcom's proposals and will have little ability to set such prices even if it did.

(d) An active minus approach will maintain the current tariff gradient between 1Gbit/s and 100Mbit/s services. However, a significant benefit of passive remedies is that they permit CPs to respond to precise and many varied demand of customers for bandwidth at different levels (1, 2, 3, 4, 5Gbit/s etc) rather than be told what increments (1Gbit/s, 10Gibt/s etc) they can purchase by Openreach. A cost based approach will empower CPs to respond to demand in this way and lead to such a flatter wholesale pricing structure.

(e) A cost based approach will achieve greater gains in productive efficiency than active minus. This is due to increased competition in the active layer, more appropriate build-or-buy signals for potential entrants and less duplication of passive assets. The increased certainty under a cost-plus approach could further stimulate uptake of dark fibre and lead to greater innovation in the active layer.

84. In our view, cost-plus pricing offers a straightforward way to implement a dark fibre remedy with minimal economic risk to BT in relation to its ability to recover its costs with a properly calibrated charge control.

85. We would be happy to discuss this with you and potential cost modelling approaches if that would be of assistance.

Annex - Response to the consultation questions

Question 2.1: Do you agree with our findings in relation to product market definition as set out in paragraphs 2.9 to 2.13 of the BCMR Temporary Conditions Statement, namely that we define a market comprising wholesale leased line services of all bandwidths at and below 1Gbit/s using contemporary interface (CI) technologies, including EFM? Please set out your reasons and supporting evidence for your response.

In these particular circumstances of the Temporary Measures, the PAG strongly agrees with Ofcom's approach to product market definition in paragraph 2.9 to 2.13 of the BCMR temporary Conditions Statement. See section 3 for our reasons and full response.

Question 2.2: Do you agree with our findings in relation to geographic market definition as set out in paragraphs 2.14 to 2.19 of the BCMR Temporary Conditions Statement, namely that we define the following geographic markets: (a) the CLA; (b) the LP; (c) the CBDs of each of Birmingham, Bristol, Leeds, Glasgow and Manchester; and (d) the RoUK excluding the Five CBDs? Please set out your reasons and supporting evidence for your response.

In these particular circumstances of the Temporary Measures, the PAG strongly agrees with Ofcom's approach to geographic market definition in paragraph 2.9 to 2.13 of the BCMR temporary Conditions Statement. See section 3 for our reasons and full response.

Question 2.4: Do you agree with our findings that BT has SMP in the markets for Lower Bandwidth CISBO services in the LP, the CBDs of each of Bristol and Manchester and the RoUK excluding the Five CBDs, up to the end of March 2019, as set out in paragraphs 2.20 to 2.100 of the BCMR Temporary Conditions Statement? Please set out your reasons and supporting evidence for your response.

Partly agree; Ofcom still supports Ofcom's 2016 BCMR statement that BT had SMP in all CISBO services in the RoUK including the CBDs. See our full answer in section 3 of the main document.

Question 3.1: Do you agree with our proposed design of the dark fibre access remedy? Please set out your reasons and supporting evidence for your response.

Yes; but only as a temporary remedy and to pave the way to a remedy which is available above 1Gbit/s. The PAG considers that the pricing approach adopted (i.e. not 'cost plus') makes the remedy static at 1Gbit/s as it will not be attractive at any bandwidth below 1Gbit/s. For our full answer to this question see section 5 of this response.

Question 3.2: If BT were to make available a dark fibre product based on the design set out above, how long would it take before your company was in a position to purchase it? From what date would you want BT to make such product available?

Given that Openreach customers were originally expecting the dark fibre product launch on October 2018, the PAG members are already in a position to purchase this product.

Question 4.1 Do you agree with our assessment of the benefits of our proposed dark fibre remedy? Please set out your reasons and supporting evidence for your response

At paragraph 4.13 of the consultation document Ofcom identifies the scope of cost savings through the reduction in equipment. Although Ofcom asserted this in the 2016 BCMR statement it now believes that the cost saving is greater than previously established.

The PAG has provided evidence above which supports Ofcom's view that there are likely to be significant cost savings from DFA.

Even if the cost savings were marginal, as we have set out in the main body of our response there are other benefits from dark fibre such as innovation, competition and increased efficiency. While the PAG has highlighted in the past that CPs will derive the most benefit from being able to use the product above 1Gbit/s. However irrespective of bandwidth, as we have set out in section 4 dark fibre allows CPs to connect any equipment they choose allowing scope to use equipment that better suits their customer needs promoting competition and innovation, including from equipment vendors, which is likely to lead to even further cost savings.

Question 4.4: Do you agree with our assessment of the risks and costs of our proposed dark fibre remedy? Please set out your reasons and supporting evidence for your response.

The PAG considers that the overall level of risk of introducing this remedy is low. However, it considers that Ofcom's chosen pricing approach reduces the scope of benefits of the remedy.

Question 4.5 Do you agree that we should impose a dark fibre remedy for the period April 2018 to March 2019? Please set out your reasons and supporting evidence for your response

Yes; for all the reasons highlighted throughout the main body of this consultation

Question 5.1 Do you agree with our forecast for dark fibre take-up in 2018/19? Please set out your reasons and supporting evidence for your response, including any volume forecasts you have for consumption of dark fibre 2018/19.

The PAG considers Ofcom's forecasts, using data from across the entire industry, seem consistent with their own evidence we have provided. It is important to emphasise that, as with any new remedy, demand could very likely be much higher once SLA/SLGs are fully in place and DFA 'settles in' as interest and use cases develop further from observable, tangible examples of dark fibre benefits working in practice. Individual CPs will provide their own individual forecasts of demand for the period to April 2019.

Question 5.2: Do you agree with our proposed charge control on the proposed dark fibre product? Please set out your reasons and supporting evidence for your response.

No, we consider it reduces the scope of benefits from competition - see our response in section 5 - but we welcome the introduction of the remedy in whatever form.