NON-CONFIDENTIAL VERSION

BUSINESS CONNECTIVITY MARKET REVIEW

OFCOM PRELIMINARY CONSULTATION ON PASSIVE REMEDIES

RESPONSE BY GTC

A SUBSIDIARY OF BROOKFIELD UTILITIES UK

5 JANUARY 2015



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LEGAL ANNEX PREPARED BY NABARRO

1. INTRODUCTION

- 1.1 GTC is a subsidiary of Brookfield Utilities UK ("**BUUK**") which is a provider, owner and operator of last-mile utility infrastructure for new-build homes. GTC has experienced considerable success in contracting with developers to provide new connections to gas and electricity networks, and more recently to water networks. Once built these public utility networks are owned and operated under licence and regulated as appropriate by Ofgem and Ofwat. GTC has all the same licence obligations and duties as any other utility network operator.
- 1.2 GTC has started to expand its offering into the telecommunications sector to provide a timely, efficient and cost-effective quad-utility connection service thus removing delays in house building programmes caused by otherwise often late utility connections services. GTC lays fibre-to-the-premises ("FTTP") and offers a minimum download speed to householders of 50 Mbps with options of higher speeds up to 300 Mbps available with no distance-related speed degradation. Householders can also choose symmetrical upload speeds, an option which is much appreciated by homeworkers.
- 1.3 Once built, the FTTP infrastructure will be owned and operated in perpetuity as are the other public utility networks built by GTC. BUUK has "code powers" under Section 106 of the Communications Act 2003 via its subsidiary Independent Next Generation Networks Limited ("INGNL").

2. EXECUTIVE SUMMARY

2.1 GTC always lays FTTP, in contrast to BT, which continues to provide new homeowners with foreseeably obsolete copper connections, and often provides these services late to developers of new homes. More than 2 million UK consumers living in ~750,000 new homes could potentially benefit from superior internet via GTC or other FTTP providers in the 3 year period from 2016-2019.

There are barriers to ex ante competition in new-build fibre connectivity

- 2.2 BT does not presently make a product available that would allow Originating Communications Providers ("**OCP**s") other than BT (or KCOM in Hull) to cost-effectively connect new homes to the national fibre network. Current connectivity options available to other OCPs are of limited assistance:
 - (a) connecting directly to non-BT core backhaul providers via self-laying fibre is only viable at around 20% of developments;
 - (b) connecting to the national backhaul network using BT's EAD product is only costeffective in a further 10% of instances (the reasons EAD is unsuitable are explored in detail in Section 5 of this paper); and
 - (c) the existing Passive Infrastructure Access remedy cannot be used for this purpose.
- 2.3 Consequently, GTC and other OCPs are unable to offer services to benefit consumers at 70% of new housing developments across the UK. Even this partial degree of availability of GTC's service does not translate into equivalent success rates in winning actual

connections. GTC estimates that in 2014 it only won tenders to connect around [\approx]% of new homes in the UK; BT won 90-95% of tenders.

- 2.4 [×]
- 2.5 [≫]. Owners of newly-constructed homes, having bought their house expecting modern building materials and connectivity, are often surprised that their new connection is copperbased, and that they are unable to benefit from the world-class broadband that they want and deserve.

The benefits that only a passive access remedy can bring

- 2.6 GTC very much welcomes Ofcom's decision to issue this preliminary consultation on the potential use of, and scope of, passive remedies at this early stage in the Business Connectivity Market Review ("**BCMR**") cycle. It is essential that Ofcom considers the significant benefits that passive remedies can bring across a range of uses in much greater depth than it has done previously. In the case of GTC's focus on new homes, the range of benefits that a dark fibre access remedy could bring are incontrovertible:
 - (a) True *ex ante* competition for the installation of infrastructure for new housing could be finally unleashed. As with other utilities in the past, GTC believes that intense competition will develop quickly, driving faster, more attentive and more cost-effective service for developers, consumers and businesses alike.
 - (b) Consumers would be able to benefit from the fastest internet speeds available today of up to 300Mbps, over network architecture that is future-proofed and able to be upgraded as communications networks continually increase their speeds.
 - (c) Home workers would be benefit from equivalent upload and download speeds.
 - (d) Installing FTTP now drives CapEx efficiencies there will be no need to upgrade from a copper connection to a fibre connection in 10 years.
 - (e) Although CPs such as GTC would be able to kick-start the UK's transition to FTTP based on new homes, it is inevitable that owners of existing properties will also start to demand better broadband. CPs will therefore need to accelerate the provision of viable FTTP products to existing properties as well as new ones, widening benefits even further.

The remedy requested

- 2.7 In order to be able to offer these substantial benefits, GTC puts forward in this paper proposals for a new category of dark fibre access remedy specifically targeted at stimulating competition in the provision of fibre connectivity to new housing developments. Two variants would be required to realise the greatest potential benefits:
 - (a) Point-to-point 'Aggregation Backhaul'. Access to a pair of fibres utilised for backhaul of traffic from an onsite active PON multiplexer to a third party backhaul network at a hand-off point or local exchange. This product would carry backhaul traffic, typically comprising of many tens or hundreds of users per fibre pair.
 - (b) Point-to-point 'Access Backhaul'. Access to individual fibres to be utilised for backhaul of traffic from an onsite Passive Optical Splitter to a PON multiplexer located at a hand-off point or local exchange. This product would carry access traffic, typically comprising of up to 32 users per fibre.

Practical issues

- 2.8 Ofcom has raised some concerns that the introduction of passive remedies could lead to competitive distortions which may not be in the long term interest of consumers of communications services, The use which GTC wishes to make of passive access would clearly be pro-competitive and to the benefit of consumers. The concerns raised by Ofcom are not relevant in this case for a number of reasons:
 - GTC is seeking to use passive products to extend the addressable market of new housing developments, rather than as a simple lower cost substitute for existing active products regulated in the BCMR;
 - (b) the use of passive access will allow GTC to make efficient investment choices in terms of the equipment it provides, avoiding unnecessary duplication of BT's existing network; and
 - (c) GTC is seeking access on non-discriminatory terms making the same contribution to BT's fixed and common costs as BT itself makes in providing services in downstream markets.
- 2.9 The BT active services currently used by GTC for backhaul, Ethernet EAD services, are designed primarily for corporate connectivity. The pricing of these services, and in particular the prices of the high bandwidth services required to backhaul consumer ultrafast fast broadband, reflects the high willingness of corporate users to pay for high quality symmetric access. As a result these services make a proportionately high contribution to the recovery of the common costs of BT's network. However, the consumer products that BT provide in competition with GTC, using fibre backhaul, make a much lower contribution to common costs per user than EAD. This mean that the current active products do not allow GTC to compete with BT to serve smaller developments using EAD as the effective contribution per home service to BT's common costs, would be much greater than that made by BT.
- 2.10 In order to allow it to compete with BT in providing connections to new housing developments, GTC proposes that the pricing of both variants of the passive backhaul service should reflect the equivalent common cost recovery made by BT in the downstream markets. As a result the pricing would consist of two components:
 - (a) the incremental costs of providing the fibre used for the backhaul service; and
 - (b) a contribution to the fixed and common costs of the E-side network based on the number of homes served, with the level of the contribution being based on the contribution made by equivalent BT consumer services.

Response structure

- 2.11 This Response is broken down into three documents.
 - (a) This main **Response Document**, which sets out a detailed case for the remedy proposed above. GTC has also given thought to the 11 specific questions that Ofcom has raised. GTC's responses have been worked into its Response Paper, although a summary, together with cross-references to pertinent paragraphs, can be found in Section 9.
 - (b) An Economics Annex, produced by Frontier Economics. This considers the multitude of economic benefits that would be derived from a passive remedy for local backhaul to serve new housing developments. It also observes the reasons why the dis-benefits of passive remedies that have previously been claimed in

general by BT are inapplicable with respect to the remedy that GTC is advocating. Finally, the Annex considers the optimum pricing that should be built into any remedy so as to be fair to all market participants.

(c) A Legal Annex, produced by Nabarro. GTC has carefully considered the scope of the remedy that it is requesting within the parameters of the relevant UK and EU legislation. This Annex explains why the remedy it is requesting falls squarely within the ambit of the BCMR such that there should be no delay in Ofcom taking action to help secure the broadband service that UK customers want and deserve.

3. INTRODUCTION TO GTC

- 3.1 BUUK has been providing, owning and operating essential last mile utility infrastructure for new-build homes in all regions of mainland UK for over 20 years.
- 3.2 BUUK's market-facing brand is GTC ("GTC") (this term is used to describe the author of this response in the remainder of the document). GTC designs, builds and then owns and operates fully regulated distribution networks for gas, water and electricity and much less regulated networks for district energy and telecommunications. As of today GTC is operating networks that serve circa 1.2 million homes throughout mainland UK via one or more of its utility networks. It is connecting ~[%] new homes a year with gas and electricity, increasing numbers with water and also with FTTP telecommunications connections.
- 3.3 GTC has a strong competitive track record in driving down prices and driving up service levels in the installation of utility infrastructure. Two decades ago, incumbent monopolists in gas and electricity provided sluggish connection services, plagued with delays (not unlike the position frequently reported by developers about BT today). By contrast, GTC and other independent utility infrastructure providers are now chosen by developers in a competitive market process based on responsive service delivery and keen prices. Whilst the structure of telecommunications markets has some differences, GTC considers that the supply of FTTP connections to new homes could benefit from the same significant improvements that competition has brought to the installation of other utility services.
- 3.4 BUUK acquired the FTTP business known as Independent Fibre Networks Limited ("**IFNL**") in 2012, alongside IFNL's parent company, Inexus. The acquisition means that BUUK now offers telecommunications services under four different brands, each targeted at a different customer segment:
 - (a) FTTP connection services are marketed to housing developers under the **GTC** brand as part of a quad-utility connection service.
 - (b) **INGNL** takes ownership of the fibre after it has been constructed and has "code powers" under Section 106 of the Communications Act 2003.
 - (c) IFNL markets wholesale fibre connectivity to retail ISPs using infrastructure owned by INGNL. For example, Direct Save Telecom provides services to households via a wholesale contract entered into with IFNL and a number of other ISPs are now taking steps to also provide services.
 - (d) BUUK also owns a retail ISP marketed to consumers called **seethelight**, offering ultra-fast broadband speeds of up to 300 Mbps (minimum 50Mbps)
- 3.5 GTC's corporate objectives are driven by those of the Brookfield Group as a whole. Brookfield is a global alternative asset manager with over a 100-year history of owning and

operating assets with a focus on property and infrastructure in particular. Consequently, GTC has no interest in short-term opportunism or arbitrage opportunities. It aims to become a credible long-term infrastructure owner and operator that competes strongly with BT on price and service. GTC would like to attract as many third party ISPs to operate over its installed infrastructure as possible, including BT Retail (although BT has so far refused to do so).

3.6 In pursuit of the objective of making connectivity markets open and inter-connectable, GTC has been an active participant in recent industry initiatives to standardise connectivity technologies between CPs. For example, GTC has taken a leading role within the Network Interoperability Consultative Committee ("NICC") that is steering the development of the Active Line Access ("ALA") standards. ALA defines an architecture and service template for Ethernet access services delivered over NGA networks. It enables NGA networks to provide connectivity between residential and business consumers and CPs in an open and flexible way. GTC continues to support and attend other industry and standard-setting events with the goal of establishing a mature open connectivity market.

4. TANGIBLE BENEFITS WOULD BE DELIVERED FROM COMPETITION FOR THE PROVISION OF FIBRE INFRASTRUCTURE TO NEW HOMES

- 4.1 The Government has made clear its goal of achieving superfast broadband for as large a proportion of the population as possible both for its own sake and to meet the EU "Digital Agenda". As Ofcom is aware, this sets the goals of superfast broadband coverage at 30Mbps available to all EU citizens; with at least 50% of European households subscribing to broadband access at 100Mbps.
- 4.2 The reality is that the UK is on course to achieve neither goal. Progress is being hampered in part by BT's on-going near-monopoly in new installations. This means that BT can choose to continue installing copper-based technology to most new housing developments, safe in the knowledge that no OCP can provide a better, alternative service. This is inherently problematic because as consumers demand greater and greater speeds, copper infrastructure will eventually need to be upgraded to fibre in any event¹.
- 4.3 BT is able to prevent entrants from competing with it for the provision of access infrastructure in the vast majority of new housing developments because of its control over the only duct and fibre network with availability throughout the UK. By stymieing any competition in most new developments BT is able to reserve the market for itself. As a result, homebuyers lose out: poor quality connections; homes connected with legacy copper based technology which will quickly become obsolete; and access solutions which are more costly and more prone to faults.
- 4.4 New house-buyers deserve better. In what, for most, is the biggest investment of their lives, homebuyers often struggle to comprehend that their new home (otherwise equipped with the most up to date equipment, and modern, environmentally friendly building materials), uses legacy copper based technology for its telecommunication services.
- 4.5 Genuine *ex ante* competition for the supply of infrastructure would achieve a number of major benefits:

¹ These issues are clearly of concern to the Government, given the active interest recently shown by Edward Vaizey MP, the Minister for Culture, Communications and Creative Industries in improving the provision of superfast broadband for new housing.

- 4.5.1 **First,** it would speed up the activation of new homes. BT is, by any measure, woefully inefficient at connecting prospective customers to its network. Waits of up to six months to obtain a new connection to new-build homes are common². These delays are the behaviour of a monopolist acting absent the constraint of competition. House builders do not consider that they have a genuine choice in the provisioning of telecommunications networks. They usually see themselves as limited to BT. This is despite the fact that new-build homes do not have existing connections with associated sunk costs, meaning the choice of technology and provider used to connect should be less constrained than for existing homes.
- 4.5.2 **Second,** infrastructure competition would provide better broadband technology which consumers are demanding today.
 - (a) BT's current rollout of a service offering "up to" 76Mbps for downloads (but only "up to" 19Mbps for uploads) is based on FTTC technology and still uses copper as the final connection. However, actual broadband speeds vary considerably depending on distance between the cabinet and the premises. It is believed that download speeds of less than 42Mbps are more typical.³
 - (b) By contrast, GTC installs an FTTP service based on GPON technology. This offers cost advantages over point-to-point fibre networks by passively combining traffic from a number of subscribers onto a single fibre. FTTP can be used to facilitate the delivery of a triple-play bundle of voice, broadband and television which:
 - (i) currently delivers download speeds of between 50 and 300Mbps;
 - (ii) is future-proofed⁴ and could deliver speeds many times faster as demand for bandwidth continues to grow exponentially;
 - (iii) unlike BT's FTTP offering, can facilitate ISPs offering consumer packages that include the <u>same speed</u> for upload as they do for download (facilitating home working); and
 - (iv) does not vary in speed depending on distance from street cabinet.
 - (c) Most homes have multiple occupants, who may each own several connected devices. Therefore it is not unusual to have more than 10 internet-enabled devices in a typical home. Whilst speeds demanded are set to grow exponentially in the coming years, it is very easy to see how even today, a home could require substantial and ever-growing peak capacity.
 - (d) New-build properties are typically built to a higher specification than existing housing stock. They tend to attract occupants who demand best-in-class broadband infrastructure, which means FTTP.
 - (e) FTTP networks have relatively low operating costs compared to competing technologies such as FTTC as:
 - (i) active equipment can be concentrated in a small number of locations where it can be easily operated and maintained; and

PON.

² For example, BBC Watchdog's broadcast on 20 November 2014 featured a development of flats where consumers were forced to wait 9 months before BT would provide a broadband connection. See also an April 2013 Guardian article: http://www.theguardian.com/money/2013/apr/20/BTO-failure-connect ; an article from 'This is Money' from March 2014: http://www.theguardian.com/money/2013/apr/20/BTO-failure-connect ; an article from 'This is Money' from March 2014: http://www.thisismoney.co.uk/money/bills/article-2570094/BTO-Openreach-taken-four-months-connect-house-internet.html. ³ Source: Ofcom publication: UK Fixed-line Broadband Performance, May 2014. Data for 'FTTx' (i.e. FTTC and FTTP combined, "bottom between the second barded").

at Figure 1.4. 4 GTC would be able to utilise its technology of choice, evolving at its own rate and not constrained by BT's slower approach. For example, GTC would be able to accelerate the adoption of NGA technologies such as XG-GPON 1, TWDM PON and WDM

- (ii) fibre cables are less susceptible to faults, for example due to water ingress, than copper cables used for FTTC/VDSL services.
- 4.5.3 Third, GTC's solution involves a single installation process to reach FTTP speeds, in contrast to BT's two-step approach of installing copper but later upgrading this to fibre. Even if it were assumed that the speeds achieved under BT's FTTC solution are presently sufficient it is inevitable that greater speeds than BT's copper can deliver will be needed in the near future. Despite this, BT has announced no date by which it intends to make FTTP a default technology for new connections (let alone retro-fitting existing connections)⁵. At the recent Government-sponsored⁶ 'New Build Round-table' discussions, BT stated that its only obligation under the Universal Service Obligation is to install copper. It said that it considers fibre (both FTTC and FTTP) to be a premium product and will only guarantee to deploy FTTP in particular to a development where a developer co-funds it. If not, GTC understands that on occasions BT will agree to install fibre, but make a last-minute change to deliver copper. This is a very different approach to that used by GTC, where the developer agreement specifies the details of the solution that is provided. GTC estimates that on the basis of this unhelpful connections model by BT, it is unlikely that the UK will achieve full FTTP coverage before the second half of the 2020s. This means that developments could continue to be connected using BT's copper technology for up to another 10 -15 years. There will be particular inefficiencies and environmental costs for properties being built now, because already-obsolete copper lines are being installed that will need to be replaced by fibre in as little as ten years.
- 4.5.4 **Fourth,** GTC can install ducts and fibre for communications networks at the same time that it installs infrastructure for other utilities: electricity, gas and water. This economy of scope allows GTC to offer services more efficiently than other operators who either have to install infrastructure separately or utilise infrastructure built by other contractors. A single point of contact for all utilities also provides a better service to developers and incurs less disruption to the construction programme.
- 4.6 Despite this multitude of benefits, only [≫] new homes are presently contracted to benefit from GTC's FTTP network, and only [≫] newly-constructed homes are being served by GTC already. This is because GTC is blocked by a lack of a BT product from offering a fibre network to 100% of UK housing developments.
- 4.7 If GTC and other OCPs secured a suitable remedy to connect to BT's network, they could accelerate the delivery of the qualitative benefits set out above to a significant proportion of the UK's housing stock.
 - (a) Within the period from 2016 to 2019 during which any Ofcom-mandated remedies may stand, GTC estimates that between 0.5 and 0.75 million properties will be constructed. As a result, up to around 2 million consumers living in those properties could benefit from FTTP connectivity if appropriate BT products were made available to OCPs. Clearly GTC alone is unlikely to win contracts to connect all of these with fibre. However, once consumers consider FTTP to be standard, it is likely that other infrastructure providers to new properties will also be required to deliver it.

⁵ It is also worth noting that the UK's Universal Service Obligation ("**USO**") only mandates that BT should provide a voice connection and/or basic broadband on demand. There are no current plans to upgrade the USO to mandate best available speeds - which means that BT will only offer FTTP when it is in its interests to do so, rather than when consumers or developers request it.

⁶ Led by Edward Vaizey MP, the Minister for Culture, Communications and Creative Industries.

(b) There are also externalities from providing FTTP in new-builds. The existence of a significant proportion of FTTP-enabled homes is likely to raise customer awareness and as a consequence increase demand from consumers for the services and applications that only FTTP can deliver. This will lead to accelerated investment in access networks amongst existing housing stock. For example a consumer used to having FTTP functionality in a new-build property will likely look for this to be installed if they subsequently move to an older property.

5. BENEFITS OF EX ANTE COMPETITION TO PROVIDE FIBRE INFRASTRUCTURE TO NEW HOMES CAN ONLY BE REALISED VIA A PASSIVE REMEDY

- 5.1 Although GTC has a competitive advantage in the construction of infrastructure within new developments as a result of its multi-utility approach, it needs to connect its FTTP-based infrastructure within the boundary of each development to the national telecommunications network.
- 5.2 GTC is able to purchase core network connectivity at a reasonable price. However, it faces difficulties in creating a 'point-to-point' backhaul link between its On-Site Connection Point ("**OSCP**") and the local exchange (or an access provider's point-of-presence ("**POP**") if this is closer). This requirement falls within the ambit of the BCMR, as set out in GTC's Legal Annex.
- 5.3 This section explains why there is at present no method that is consistently viable for GTC to secure the access that it needs:
 - (a) firstly it describes the difficulties GTC faces in economically laying its own fibre to a point where it can interconnect with core backhaul networks ("**Option 1**");
 - (b) it explains why the existing EAD product supplied by BT ("**Option 2**") is generally an unsuitable remedy for local backhaul; and
 - (c) it then explains that there is currently no BT product which allows the type of passive access that OCPs need to BT's network.
- 5.4 This current lack of availability of upstream networks in close proximity to developments where GTC is invited to tender to provide telecommunications connectivity is of major concern. It means that 70% of new build developments are not financially viable for operators such as GTC to connect. This denies UK consumers the chance to benefit from enhancements in service that could be delivered by true *ex ante* competition in the supply of access infrastructure.

Current Option 1: self-laying fibre to a joint with an OCP's network/the exchange

5.5 The connection model that GTC uses to self-lay fibre is set out in Figure 1 below.

Figure 1



Current Option 1: lay fibre to a joint with an OCP's network

- 5.6 GTC locates a fibre loop belonging to an OCP that is within an economical range to interconnect. It then lays a length of fibre from an aggregating OSCP node located inside the perimeter of the development to a connecting point (labelled as "Fibre Demarcation Point" in the Option 1 diagram) with another OCPs network. This will be either the exchange or a suitable passive backhaul connection point.
- 5.7 The OCP provides an active local backhaul service between its core network and the OSCP potentially across two joined lengths of fibre:
 - (a) GTC-owned fibre from the OSCP to the Fibre Demarcation Point
 - (b) OCP-owned fibre from the Fibre Demarcation Point to the OCP's core network (if the Fibre Demarcation Point is not located at an exchange).
- 5.8 This system is technically sound, but can only be used **in around 20% of locations** where the break-in point to the OCP's network is close enough to make it cost-effective. In general, the larger the number of homes on a development, the further it will be cost-effective to GTC to dig and these distances can typically be 5km or 10km for large development sites. In most cases, the long dig route passes a much closer potential BT connection point in order to reach the OCP's connection point, because no passive access is available to the BT network.
- 5.9 A decision to dig is taken by comparing the financial business case against that for leased circuits, on a case-by-case basis. However, opening road surfaces to install a duct and fibre run is very expensive. Even relatively short distances of 1km can incur costs in excess of £100,000, once installation costs of approximately £[≫] £[≫] /metre, together with ongoing operational and maintenance costs, are taken into account. For the vast majority of new UK developments, the volume of homes on site is insufficient to justify the fixed cost of installing the required lengths of duct.
- 5.10 GTC makes its assessments based on an industry-standard model of the 'viability' of particular developments. The model assumes that all new homes at a particular development are connected on day 1 and that no replacement expenditure ("**RepEx**") is required during the lifetime of the infrastructure. GTC has modelled the viability for all potential connectivity solutions discussed in the remainder of this paper on the following basis:

- (a) Modelled annual EBITDA per development is calculated by:
 - (i) Subtracting all "OpEx Costs" from an assumed development-wide "Weight Revenue".
 - (ii) The "Weight Revenue" is defined as "Revenue" multiplied by the "Penetration Rate".
 - (iii) "Revenue" earned per connected household per annum is assumed to be £192.48, based on BT Openreach's published revenue of £16.04 per month for Fibre Voice Access service in combination with a Generic Ethernet Access (GEA) service at 40Mbit/s/10Mbit/s.⁷
 - (iv) The "Penetration Rate" is 84% i.e. 84 out of every 100 new homes opt to sign a contract with the CP that has laid the connection to their home.⁸
 - (v) "OpEx Costs" include: EAD/Dark fibre rentals, Fibre plant and active equipment maintenance, electricity, systems maintenance, Business Rates etc.
- (b) The EBITDA value is then divided by a "Required Return Rate" (i.e. an assumed reasonable annual return on the capital invested in the new network) to derive a value for "Fundable CapEx".
- (c) Required CapEx is the total CapEx to build the infrastructure to the site (it includes Local Exchange construction, Active Electronics, on-site fibre plant, EAD/Dig/Dark fibre connection fees and Backhaul network connections fees).
- (d) If the figure for "Fundable CapEx" is greater than the "Required CapEx", the development is **deemed viable**. If "Fundable CapEx" is lower, the development is **deemed not viable**.
- 5.11 By way of illustration, GTC has modelled in Table 1 below the minimum number of homes that might make it viable to dig and self-lay specified lengths of fibre from a jointing chamber at the edge of a development site to an OCP backhaul network⁹. It can be seen that the number of homes required in order to ensure that a development is viable increases steeply as the development's distance from the exchange increases. Two types of dig are shown:
 - (a) A dig comprising entirely of carriageway/pavements which has an assumed average cost of £[≫] per metre; and
 - (b) A dig that is made (i) mostly under verges, which has an assumed average of £[≫] per metre; with (ii) 50 metres being laid under carriageway/pavement at a cost of £[≫] per metre.

⁷ Source: Openreach Superfast Fibre Access Price List, 5.1.4 Fibre Voice Access 4/11/14

⁸ Source: BT Openreach connection penetration ratio as set out in Ofcom's Communications Market Report 7th Aug 2014 ⁹ Modelling was performed using quotes for digging and laying fibre that GTC typically receives from its civil engineering contractors.

Table 1

	Dig entirely in carriageway / pavement			Dig in verge with 50 metres of carriageway / pavement		
Dig Length	CapEx	OpEx	Minimum number of new homes on site to make dig viable	CapEx	ОрЕх	Number of new homes on site to make dig viable
50m	£[≫]	£10.68	33	£[×]	£10.68	33
250m	£[≫]	£10.68	48	£[×]	£10.68	38
800m	£[×]	£10.68	89	£[×]	£10.68	52
4,000m	£[≫]	£10.68	329	£[×]	£10.68	132
12,000m	£[×]	£10.68	935	£[×]	£10.68	332
20,000m	£[×]	£10.68	1537	£[≫]	£10.68	534

Illustrative cost of self-laying fibre to connect development to OCP network

- 5.12 GTC has also considered the relative cost of different backhaul solutions when used in relation to a single hypothetical development that it might be asked to connect, comprising 50 homes located around 4km from the nearest exchange or OCP point of presence ("**POP**"). In the remainder of this paper, GTC will refer to this as a "**Typical Development**".
- 5.13 In this example, the annual wholesale revenue for serving this development can be estimated by following the viability model outlined in para 5.10 above, by:
 - (a) Taking Openreach's annual published income per user of £192.48 and assuming that GTC could derive a similar income from each premises that its network connected. This would be multiplied by 50, and then by 0.84 (the penetration rate) to derive an annual wholesale income total for the development. The final total in this case would be ~ £8084 (192.48 x 50 x 0.84).
 - (b) Deducting projected annual OpEx per home of 10.68 (taking account of the 0.84 penetration rate) leads to a deduction of £448.56.
 - (c) This would leave an annual margin of around £7,600. This would be insufficient to ever fund CapEx of around £275,000 (including elements not particularised in Table 1) for a 4km dig. Therefore this development would not be viable.
- 5.14 Self-laying ducts and fibre also incurs a number of other significant and well-known disadvantages:
 - (a) Duplication of network infrastructure extensive 'parallel laying' that duplicates BT's existing fibre and duct network would under-utilise BT's assets, as well as GTC's. It would delay the recoupment of associated sunk costs.
 - (b) Delay opening road surfaces is a time-consuming process. Obtaining the necessary permissions from the local authority can take in excess of three months. The dig process itself can take many further months, particularly in cities where restricted working hours will often be imposed.
 - (c) Obstacles routes can contain specific features such as river or railway lines. There may be physically no space for new ducts on any bridges or tunnels that cross them. This cannot always be mitigated by utilising alternative routes. Even if an alternative is found, this will be longer and more expensive.

(d) Inconvenience to the general public – opening roads in order to lay new service media causes considerable nuisance due to factors such as road and footpath closures, installing temporary traffic light and noise pollution.

Current Option 2: connect via BT EAD to OCP's equipment at BT exchange / POP

5.15 Ofcom has of course mandated a series of active access products following the 2013 BCMR. In locations where an OCP may not have a suitable fibre loop close enough to a development for GTC to self-lay fibre, an active BT EAD circuit can be purchased to run from the OSCP to the OCP's network. Cases where EAD is viable will usually be where it is possible to use the most cost-effective Local Access EAD circuit to provide backhaul to the OCP's network at a BT exchange. GTC has termed this Option 2. GTC estimates that this approach is viable at around 10% of possible sites. This is illustrated in Figure 2 below.

Figure 2

Current Option 2: connect via BT EAD to OCP's equipment at BT exchange / POP



- 5.16 There are, however, a number of significant disadvantages to using EAD as a backhaul solution for new housing developments.
- 5.17 The main issue is that the high cost of EAD means in most cases it is only viable to serve large sites. For most sizes of development, the annual Operational Expenditure ("OpEx") which would be incurred by utilising EAD when considered on a per-household basis is higher than the available revenue per household. In addition, where a Local EAD circuit cannot be used, either a Standard or Extended Reach EAD connection might be used to extend the middle-mile network to a location where the OCP has a POP. These are even more expensive. As a result price points for EAD services, in particular the 1Gbps product, are at a premium.
- 5.18 Table 2 below has been constructed using the modelling parameters set out at paragraph 5.10 above. It shows that most development sizes would incur negative margins if EAD was used to connect them. This would not be viable for any operator. Furthermore, the small positive margins shown on the remaining rows would be unlikely to be sufficient to recover the investment to build the new network (including the BT EAD installation fees) and make a reasonable return. In fact, GTC estimates that these pricing issues would mean that EAD would not be an economic solution to deploy at **90%** of new developments.

Table 2

Illustrative costs of typical annual EAD product cost vs revenue (per household)

BT Product	EAD Lease Cost per Annum	No. of New Homes	EAD Cost per New Home P.A	Estimated network OpEx per Home P.A.	BT Openreach Weighted Average Revenue per Home P.A.	Available Margin P.A. available to support Install CapEx required
EAD LA	£4,440.00	5	£888.00	£10.68	£161.68	-£737.00
		10	£444.00	£10.68	£161.68	-£293.00
		20	£222.00	£10.68	£161.68	-£71.00
		40	£111.00	£10.68	£161.68	£40.00
		60	£74.00	£10.68	£161.68	£77.00
EAD	£5,664.00	5	£1,132.80	£10.68	£161.68	-£981.80
		10	£566.40	£10.68	£161.68	-£415.40
		20	£283.20	£10.68	£161.68	-£132.20
		40	£141.60	£10.68	£161.68	£9.40
		60	£94.40	£10.68	£161.68	£56.60
EAD with 4km	£7,152.00	5	£1,430.40	£10.68	£161.68	-£1,279.40
		10	£715.20	£10.68	£161.68	-£564.20
		20	£357.60	£10.68	£161.68	-£206.60
		40	£178.80	£10.68	£161.68	-£27.80
		60	£119.20	£10.68	£161.68	£31.80
EAD with 10km Main Link	£9,384.00	5	£1,876.80	£10.68	£161.68	-£1,725.80
		10	£938.40	£10.68	£161.68	-£787.40
		20	£469.20	£10.68	£161.68	-£318.20
		40	£234.60	£10.68	£161.68	-£83.60
		60	£156.40	£10.68	£161.68	-£5.40

5.19 In the case of GTC's 'Typical Development,' Table 3 below shows that the modelled available margin per annum on a per-home basis ranges from minus £36 to positive £62. However, the required CapEx for on-site and off-site installations per home is £795. It is therefore clear that there are few developments where the margin remaining after EAD charges offers a viable return.

Table 3

BT Product	EAD Lease Cost per Annum	No. of New Homes	EAD Cost per New Home P.A	Estimated network OpEx per Home P.A.	BT Openreach Weighted Average Revenue per Home P.A.	Available Margin P.A. available to support Install CapEx required
EAD LA	£4,440.00	50	£88.80	£10.68	£161.68	£62.20
EAD	£5,664.00	50	£113.28	£10.68	£161.68	£37.72
EAD with 4km Main Link	£7,152.00	50	£143.04	£10.68	£161.68	£7.96
EAD with 10km Main Link	£9,384.00	50	£187.68	£10.68	£161.68	-£36.68

Extent of viability for locations served by BT's current EAD service

- 5.20 The pricing of EAD is unsuitable for operators such as GTC, because it only reflects the characteristics of corporate markets, where single customers are willing to pay a high premium for high quality, symmetric services with no contention. This is in contrast to the largely residential market served by GTC, where customers have much lower willingness to pay for services offering high peak bandwidth on the downlink, but are willing to accept contention for shared capacity and hence lower average throughput. The nature of corporate demand means that BT is able to charge a high premium for high capacity services such a one-gigabit EAD services. The nature of residential market, with customers seeking high peak downlink speeds above 100 Mbps, means that any backhaul product used must offer connectivity at speeds greater than 100 Mbps. In practice this means the only current suitable product for backhaul is one gigabit EAD, as there is no other option between 100 Mbps and gigabit services.
- 5.21 BT's active remedies impose **inefficient network infrastructure solutions**. Whilst these are available for backhaul purposes (which GTC refers to as "**Aggregation Backhaul**" connectivity) no active remedy can be incorporated into a Passive Optical Network ("**PON**") and used as a backhaul remedy to transport GPON traffic to a remote PON multiplexer (which GTC refers to as "**Access Backhaul**" connectivity). Consequently, operators such as GTC who compete with BT cannot cost-effectively build GPON networks that would give the ability to most efficiently convey data from a housing development and aggregate it some distance away with data from other developments at an Access Backhaul point of handover. This would have a number of benefits: it would allow costs of active equipment (such as the OLT) to be shared across a number of developments; it would also be less prone to faults than backhaul solutions using active elements.
- 5.22 By contrast, when BT serves a development itself, it is <u>not</u> required to use active services nor recover the level of costs associated with EAD products. Even if BT chose to offer FTTP (which at present it refuses to do) rather than FTTC, BT would simply extend its local passive fibre network (GPON). It would then only need to recover the incremental cost of additional fibre backhaul, rather than the high level of common costs recovered by EAD services. BT can serve virtually any new home at a considerably lower cost than OCPs such as GTC could ever offer, if obliged to rely on current inadequate access arrangements.

Conclusions on existing available backhaul solutions

- 5.23 In summary, by using either Options 1 or Option 2, GTC is only able to tender to provide telecommunications connections to new homes at around 30% of new housing developments. Most recently:
 - (a) In the 11 months to the end of November 2014 GTC evaluated fibre project viability for **1147** new build developments across the UK.
 - (b) Only 283 projects (~25% of developments) proved viable using existing solutions.
 - (c) As a result GTC was prevented from bidding to provide 864 projects (equating to ~75% of developments)) because GTC could not provide an FTTP connection to those new homes on a commercially viable basis. It is clear that the smaller new-build sites are the developments that cannot withstand the high rentals associated with EAD services or the high capital costs of a lengthy middle-mile dig.
- 5.24 Even this partial degree of availability of GTC's service does not translate into equivalent success rates in winning actual connections. GTC estimates that in 2014 it only won tenders to connect around [≫]% of new homes in the UK; BT won [≫]% of tenders, with some city-centre specialists (such as Hyperoptic) also likely to have won a single-digit percentage of new connections.
- 5.25 [≻].
- 5.26 To illustrate the difficulties caused by the ineffective market structure set out above, Table 4 sets out some recent examples of developments where developers were keen for GTC to install a modern FTTP network on-site. However, in each case, a viable solution could not be found due to the cost of digging, or leasing an EAD, to the closest OCP's point of presence. Consequently these sites were all ultimately served using a copper-based network connection from BT, thus delivering significantly fewer benefits.

Table 4

Developments served by BT FTTC connections where developer requested FTTP

Development	Developer	New homes
	[×]	105
[×]	[×]	185
[×]	[×]	68
[×]	[×]	99
[×]	[×]	138
[×]	[×]	188
[×]	[×]	200
[×]	[×]	105
[×]	[×]	99
[×]	[×]	107
	[×]	66

BT refuses to grant passive access to its network that would circumvent these issues

- 5.27 The considerable problems that OCPs experience with current backhaul solutions could be circumvented if BT was willing to provide passive access to its network. BT's unwillingness to provide this access at a point allowing viable competition downstream is a major gating factor to the development of competition for the provision of fibre infrastructure to new homes.
- 5.28 In the telecommunications sector, there is of course no requirement to deal with a particular operator (unlike for other utilities). However, in most locations BT is the <u>only</u> operator with suitable infrastructure to provide backhaul to the core network.
- 5.29 GTC's predecessor organisations have previously requested passive access to BT's dark fibre, but have always been unequivocally rebuffed.¹⁰ This refusal to supply dark fibre means that BT reserves the vast majority of new connections to itself, whilst continuing to provide copper-based connections.
- 5.30 There is no reason to expect that BT will change its approach at any foreseeable point in the future. This is because BT's incentives strongly militate against this:
 - (a) If BT serves new housing developments, the investment cost of installing duct and cable is initially funded by BT. These costs are recovered through adding them to its regulatory asset base and recovering the costs through rental charges to its wider customer base. BT will have the expectation of earning a regulated return on this investment in its assets. Indeed BT has generally earned returns significantly above the determined cost of capital on its regulatory asset base¹¹.
 - (b) BT can also expect to earn incremental profits in its downstream divisions: BT Wholesale and BT Retail¹².
 - (c) Because BT being both a supplier to GTC with market power and a competitor to GTC in the provision of access to new housing developments it has no incentive to provide services to GTC on reasonable terms. This permits BT to instead reserve the vast majority of the income stream from these network extensions for itself, whilst providing a poor service to consumers that is only tenable in the absence of competition.

6. THE DARK FIBRE REMEDY REQUIRED TO DELIVER OPTIMUM CONSUMER BENEFITS

GTC's preferred remedy: technical solution

6.1 Given the shortcomings of existing access backhaul arrangements for OCPs, and BT's unwillingness to voluntarily provide an alternative solution, GTC considers that the <u>only</u> way to facilitate true *ex ante* competition to provide infrastructure is for Ofcom to mandate point-to-point passive dark fibre access between the edge of GTC's network at a development and the exchange or OCP POP.

¹⁰ GTC also notes that BT recently swiftly rejected a Statement of Requirement lodged by Vodafone that requested general dark fibre connectivity. Source: BT customer update re: SOR 8434: Dark fibre availability for direct customer connectivity, backhaul and backbone.

¹¹ Source: Frontier Economics Report prepared for Vodafone: The Profitability of BT's Regulated Services, November 2013.

¹² Although GTC also provides access to its infrastructure which would allow BT Wholesale and BT Retail to also generate profits via GTCs infrastructure.

- 6.2 Blown fibre is the everyday resource which forms the core of BT's network, and allows it to connect each new customer in a cost-effective way. It is only logical that BT's competitors should have the opportunity to serve their customers on a level playing field, in exactly the same way.
- 6.3 The multi-core and flexible nature of BT's deployed fibre network means that it should have considerable spare capacity which could be allocated to OCPs on demand as part of a dark fibre passive remedy. Where there is insufficient existing fibre in place in order to meet demand, it should be straightforward for BT to install additional capacity, because this would require exactly the same internal process as BT would undertake in order to fulfil an order under its existing active EAD remedy (or indeed if it were providing fibre backhaul to the site to provide FTTC or FTTP).
- 6.4 In fact, installing additional fibre in BT shared ducts would also be less problematic than providing dedicated sub duct access. A blown fibre cable requires less duct than the type of sub-duct that has been offered to date under the analogous WLA PIA remedy.
- 6.5 Granting access to dark fibre would also enable OCPs to offer an ever-enhanced service to customers, by granting more control over the product than if an active solution was used. Only dark fibre backhaul allows the flexibility to offer new cost effective high-bandwidth services. OCPs would be able to utilise their technology of choice, evolving at its own rate and not constrained by BT's slower approach. For example, GTC would be able to accelerate the adoption of NGA technologies such as XG-GPON 1, TWDM PON and WDM PON.
- 6.6 In this section, GTC sets out the technical characteristics of two variants of a passive dark fibre remedy that it advocates that Ofcom should adopt under the BCMR. These comprise:
 - (a) Variant 1: point-to-point 'Aggregation Backhaul'. This would consist of a pair of fibres utilised for backhaul of traffic from an onsite active PON multiplexer to a third party backhaul network at a hand-off point or local exchange. This product would carry backhaul traffic, typically comprising of many tens or hundreds of users per fibre pair.
 - (b) Variant 2: point-to-point 'Access Backhaul'. This would comprise individual fibres that would be utilised for backhaul of traffic from an onsite Passive Optical Splitter to a hand-off point or local exchange. This product would carry access traffic, typically comprising of up to 32 users per fibre.

GTC's preferred remedy: price

- 6.7 Pricing should take account of the specific purposes of these remedies to facilitate backhaul to new housing developments. This requires a modification from the approach that Ofcom has adopted to date in remedies under the BCMR, and in particular EAD, as set out in further detail at Section 3.2 of GTC's Economics Annex.
- 6.8 It is accepted that pricing should enable BT to recover an appropriate share of common costs. Currently BT achieves this in corporate markets by price discriminating between different groups of corporate customers with different demand using a bandwidth gradient. Ofcom considers that such a pricing structure can be allocatively efficient if it increases output (when compared to a more uniform pricing structure).

- 6.9 However, the current pricing structure of EAD, which is set broadly in reaction to demand from corporate connectivity customers, when used for GPON backhaul, effectively prevents GTC for competing for many potential developments as the total expected revenues from these developments is less than the rental costs of a suitable EAD circuit. Whether or not this level of cost recovery is efficient for corporate access, it does not lead to a competitive outcome in the market for new housing developments and hence efficiency could be improved by adopting a different pricing structure.
- 6.10 From an allocative efficiency perspective, a theoretically optimal structure of prices where price discrimination is possible would result in prices reflecting incremental costs, plus a contribution to fixed and common costs which reflects willingness to pay of end users. For services provided to residential developments, the aggregate willingness to pay is a function of the number of homes served and as such an efficient cost recovery of the backhaul to a housing development is likely to reflect the number of customers served.
- 6.11 Therefore, given that new connections are required for a wide range of development size which often comprise a low number of individual housing new homes (below 50), GTC considers that it would be efficient to set a price which is partly based on the number of homes in the development (or some proxy). In fact, it would be practical to implement usage based pricing for connectivity to access infrastructure, as this could be based simply on the number of homes built or connected, which can be easily measured and verified.
- 6.12 As set out in more detail in GTC's Economics Annex, GTC proposes that price should be based on two components:
 - (a) The incremental cost of fibre used for backhaul. BT should already be implicitly calculating a similar cost for BT's fibre to the cabinet service (GEA-FTTC). GTC does not have visibility of the cost of this per metre, but would note that this should be substantially less than the fibre costs underlying BT's EAD services in BT's RFS, which include a large implicit contribution to the fixed and common costs of the access network. This could include separate one off connections charges, relating the costs of provisioning the service and a rental charge to cover the long run incremental costs of operating and maintaining BT's fibre cables.
 - (b) A per-home contribution to the fixed and common costs of the part of the BT network used by the backhaul service (i.e. excluding the costs of the distribution side network that GTC is providing). GTC notes that Vodafone currently uses a similar per-user pricing structure when supplying active core connectivity to GTC, and further that these forms of pricing structure are used by other regulated industries to provide analogous access connectivity.
- 6.13 The network topographies that GTC considers workable with respect to Variants 1 and 2 are set out below, along with examples of how GTC's proposed pricing model might affect the viability of a Typical Development (as defined at para 5.12 above) of 50 homes, located 4km from the nearest exchange or POP.

Variant 1: point-to-point 'Aggregation Backhaul'

6.14 Under this Variant, GTC would lay fibre within the perimeter of any new development (represented by a dotted oval in Figure 3).

- 6.15 GTC would purchase passive access to two dark fibres from BT to span the gap between the OSCP (usually placed at the edge of a development) and a connection point with an OCP that provides core connectivity services to GTC.
- 6.16 BT would need to construct a joint chamber at each end of the passive link, which could be charged at a fair and reasonable rate.
- 6.17 GTC would construct a joint chamber at the development-facing side of the link, and level a pre-agreed length of fibre coiled within the chamber. BT would be responsible for connecting the BT chamber to the GTC chamber and pulling through the pre-agreed length of fibre in to the BT chamber. This would subsequently be spliced to BT's dark fibre infrastructure. The pre-agreed length of fibre deployed by GTC would be gifted to BT so that it would take ownership of, and operational accountability for, the fibre between the GTC and BT joint chambers. This interconnect would work in exactly the same way as the Cablelink remedy which BT presently offers at its exchanges.
- 6.18 At the exchange / POP end of the link either GTC or an OCP would construct a joint chamber adjacent to BT's chamber. Again, GTC or the OCP would provide fibre to connect the two chambers. BT would then take ownership of this fibre between the demarcation chambers.
- 6.19 Either GTC or the OCP would run an active service over the completed dark fibre link, so as to provide backhaul services to GTC. The topography of a typical connection via this method is illustrated in Figure 3 below.



Figure 3

Requested Variant 1: point-to-point 'Aggregation Backhaul'

6.20 GTC has modelled very preliminary estimates of potential pricing, based on the principles set out at paragraphs 6.7 to 6.13 above:

(a) Dark fibre cost - the pricing proposal for the passive remedy would be split into two elements, a incremental cost of fibre based on that used for BT's fibre to the cabinet service which would be calculated on a per metre basis and a contribution to the fixed and common costs of the BT network which would be based on a per user basis.

- (i) GTC does not have visibility of the incremental cost of fibre per metre, but believe that this should be substantially less than the Main Link cost underlying BT's EAD services, which includes a contribution to fixed and common costs of the network. The Main Link price for EAD is charged at 37.2p per metre. However, as the passive remedy incremental per metre charge should be substantially less than this figure, GTC has elected to utilise a rate of 12p per metre for its modelling.
- (ii) GTC has utilised publically available information to estimate the per-user contribution to the fixed and common costs of the BT network. E-side capital costs, which will include the majority of the relevant fixed and common duct costs amounts to £8.45 per line. A large proportion of this will include the costs of copper cable, which GTC would not be using. Therefore GTC has elected to utilise a rate of ~ £4.00 per user for its modelling.
- (b) Installation charges The current installation charge for EAD varies between £2,450 and £4,000 (depending on the variant chosen). GTC believes that the installation activities associated with passive remedies are less than for EAD due to not deploying active components. GTC estimates the fair cost for the activities that would remain if BT offered a passive solution to be in the region of £450 to £2,000. For modelling purposes, GTC has used a figure of £1,950.
- (c) **Excess construction charges** GTC has allowed a sample figure of £5,000 per development.
- 6.21 Subject to the assumptions above, when applied to a Typical Development:
 - (a) This development would be <u>viable</u> utilising the proposed Aggregation Backhaul remedy. The site would connect into a single GPON multiplexer located on the development site, which is 4km away from the local exchange. Based on GTC's modelling, at a distance of 4km sites down to 38 new homes are viable assuming CapEx charges of £1,950 for connection and £5,000 for ECC's an OpEx charge for the dark fibre remedy at 12p per meter charge and £4.00 per user, giving an OpEx cost of £632, split £480 for the incremental per metre charge and £152 for the contribution to the fixed and common costs. Applying this to GTC's 50-plot "Typical Development" the margin per annum available based on the proposed incremental per metre charge of £0.12 and contribution to the fixed and common costs of £4 on a per home basis is £137.40. The required CapEx for onsite and off-site installations per home is £756, which means that in this case would be sufficient margin to fund CapEx and provide a reasonable return.
 - (b) **This development would not be viable utilising EAD,** as illustrated at Table 3 above.
 - (c) This development would also not be viable utilising a self-dig solution, as illustrated at Table 1 above.

Variant 2: point-to-point 'Access Fibre'

- 6.22 Under this Variant, GTC would lay fibre within the perimeter of any new development (represented by dotted ovals in Figure 4).
- 6.23 GTC would purchase passive access to multiple point-to-point dark fibres from BT to form an extension to GTC's PON spanning the gap between an on-site passive optical splitter

located at each individual development and GTC's OSCP located at the exchange (or close to the exchange).

- 6.24 BT would need to construct a joint chamber at the development-facing end of each length of passive link. Construction costs could be charged at a fair and reasonable rate.
- 6.25 At the development end of the multi-fibre access link, the interconnection architecture would work in exactly the same manner as for Variant 1, described in paragraph 6.17 above.
- 6.26 At the exchange end, either GTC (or an OCP) would purchase a Cablelink product to connect the link to an OSCP housed within the exchange. Where GTC's OSCP equipment is not housed in the exchange and instead has been deployed in a street-side cabinet in close proximately to the exchange then the interconnection architecture described in paragraph 6.18 would be deployed. GTC would run an active backhaul service over the completed dark fibre links.
- 6.27 The topography of a typical connection via this method is illustrated in Figure 4 below.



Figure 4

Requested Variant 2: point-to-point 'Access Backhaul'

- 6.28 GTC has made very preliminary estimates of potential pricing for this remedy based on the same assumed prices per element as set out for Variant 1, on the following basis:
 - (a) **Dark fibre cost** As detailed above in para 6.20 the pricing proposal for the passive remedy is split into two elements:

- (i) incremental cost of fibre based on that used for BT's FTTC service, calculated on a per-metres; and
- (ii) a contribution to the fixed and common costs of the BT network which would be based on a per-user basis.
- (b) Installation charges As for Variant 1, GTC has modelled an installation charge of £1,950, for the first fibre. However, given that a considerable proportion of this installation cost is represented by mobilisation costs, the incremental installation cost for <u>each additional fibre</u> should be low. GTC has allocated £100 per fibre.
- (c) **Excess construction charges** as per Variant 1.
- 6.29 If we consider how Variant 2 might work when applied to a cluster of three Typical Developments (as defined above) in order to construct a PON:
 - This would be viable utilising the proposed dark fibre remedy. The three sites (a) would connect into a single GPON multiplexer located in or adjacent to the local exchange. Three individual sites could be viable at sizes as small as 16 new homes each, assuming CapEx charges of £1,950 for connection of the first fibre, £200 for the connection of the subsequent 2 fibres and £5,000 for ECC's an OpEx charge for the dark fibre remedy for 12,000 metres (4,000 x 3) at 12p per meter charge and 48 users at £4.00 per user, giving an OpEx cost of £1,632, split £1,440 for the incremental per metre charge and £192 for the contribution to the fixed and common costs, and set against the revenue assumptions set out at paragraph 5.10 above. If this solution were deployed to serve three 'Typical Developments' connected to a single PON multiplexer, the margin per annum available based on the proposed incremental per metre charge of £0.12 and contribution to the fixed and common costs of £4 on a per home basis would be £137.40. The required CapEx for on-site and offsite installations per home would be £468. It is clear that there would be sufficient margin to fund CapEx and provide a reasonable return.
 - (b) Serving these three Typical Developments would not be viable by utilising an EAD. As already set out at Table 3 above, the margin left after EAD charges is insufficient to support CapEx repayments. Because it is not possible to connect three sites to a common PON multiplexer using EAD, three separate EADs would be required along with three separate PON multiplexers. EAD could only therefore be viable with this solution if it were used to connect at least 222 homes (74 x 3) which is significantly more than for the passive remedy.
 - (c) These three Typical Developments would also not be viable using a self-dig solution. The minimum number of new homes per site to ensure each site is viable at 4km is 329 if the dig is entirely carriageway/pavement, or 132 new homes if the dig is mainly verge. Although it is possible to share a PON multiplexer between the three sites, the high number of new homes to achieve viability is due to the high CapEx cost incurred with each of the three 4km digs, as illustrated at Table 1.

Necessary arrangements for supply

- 6.30 The minimum necessary processes that BT would need to put in place in order to successfully implement any dark fibre remedy are as follows:
 - (a) Orders could be placed using a very similar process to that executed via the "eCo" portal that is used for EAD services today. This is because there is little difference

between the current provisioning processes used to assess an EAD and the assessment processes required to support a point-to-point dark fibre product. For a point-to-point dark fibre product the OCP could log on the eCo portal and enter either (i) the postal addresses; or (ii) the co-ordinates for the BT fibre demarcation points at each end of the requested service. If BT does not currently have infrastructure at a requested demarcation point, it should be responsible for extending the network to reach it. BT could levy ECCs in addition to the installation fee.

- (b) It would be critical for BT to provide a document on handover of the dark fibre that includes Optical Time Domain Reflectometry ("OTDR") tests providing end-to-end measurements for the service. This creates a 'control' data set if needed later for use as part of fault-detecting tests.
- (c) In the event of a fault, the OCP should be given the capacity to perform problem analysis in the first instance, and check that the fault does not lie in its own network. This should be straightforward if the OCP is able to make OTDR measurements.
- (d) If a fault is detected within the BT network, BT should commit to fix it within reasonable time frame that reflects the fact multiple consumer households will have been inconvenienced by the outage in connectivity.

Non-discrimination or equivalence of inputs

- 6.31 Given the market failures outlined above it is essential that entrants such as GTC are able to fairly compete with BT in the provision of access infrastructure to new developments. Ofcom has noted that EOI provides a greater degree of protection to customers of BT's services who also compete with it. Ofcom states that its *"preference would be to require BT to provide it on an EOI basis if possible"*¹³ as it offers a greater degree of protection to customers of BT and ultimately downstream consumers.
- 6.32 However, Ofcom considers that there can be a high regulatory cost to requiring EOI which relates to the cost of re-engineering of existing commissioning processes.
- 6.33 EOI protection is clearly necessary where BT has an incentive and ability to withhold access, or otherwise discriminate in a way which hinders competition. Therefore, the assessment of whether the regulatory costs of EOI outweigh the risks depends on an assessment of the risks in the specific market.
- 6.34 The specific features of competition for the supply of access infrastructure imply that BT has more scope to distort or harm competition. This is because, the tender process means that all potential competitors must have fully costed and accurate plans to deliver the services approximately four weeks after a developer issues an invitation to tender. Even short delays or risks that costs are not accurate can mean that entrants are unable to compete with BT.
- 6.35 In GTC's view, provided that BT is required to supply a properly specified dark fibre product, a 'no undue discrimination' obligation may be sufficient. This is because within a short space of time of a developer issuing an invitation to tender to GTC, it would be able to gather the relevant information from BT to enable it to compile a full and accurate tender to the developer.

¹³ Ofcom's Preliminary Consultation on Passive Remedies, para 6.32.

Risks of passive remedies on incentives to invest and the pattern of cost recovery

- 6.36 Of com identifies a number of potential risks. These include:
 - (a) dynamic efficiency, including investment incentives for BT and OCPs; and
 - (b) allocative efficiency and distributional impacts arising from the implications for common cost recovery and rebalancing of prices.
- 6.37 In relation to *dynamic efficiency* risks Ofcom considers that:
 - (a) passive remedies could lead to CPs' investments being stranded, or could limit CP's incentives to make further investments in their networks;
 - (b) passive remedies could inhibit BT's incentives to invest; and
 - (c) that wrongly set passive remedy prices could lead to inefficient choices as users choose between a passive or active product based on regulatory prices, rather than the underlying efficiency of the technology.
- 6.38 GTC notes that the scope for any of these risks to be significant depends on the scope of the remedy. Tightly defined remedies which are aimed at the specific market failure that GTC raises in this response will tend to have lower risk than broader remedies. This is both because narrow remedies will limit the number of CPs that could be affected by the remedy, and the remedy and pricing will be tightly focused on specific market considerations.
- 6.39 The remedies being proposed by GTC, and in particular the pricing, are narrowly designed for the segment in which GTC operates where the concerns raised by Ofcom are much less relevant. In addition the remedies proposed aim to address concerns related to distortions in investment decisions.
- 6.40 GTC does not consider that there is a significant risk that a **large volume of assets made under the existing regulatory regime would become stranded** if passive remedies are introduced.
- 6.40.1 The fibre assets deployed by OCPs currently used by GTC were not built to serve new housing developments. Only coincidentally do these fibre networks pass sufficiently close to a new development to be used by GTC and the current volume of services bought is relatively small. Thus any stranding due to the replacement of OCPs services by BT passive access would be minimal.
- 6.40.2 The current use of EAD for backhaul purposes is clearly inefficient and a very small element of demand. There would be little scope for BT's active assets to be stranded by a move to passive access.
- 6.41 In relation to BT's recovery of common costs, GTC fully supports the objective that prices should be set such that BT is able to fully recover its common costs. The pricing proposals set out above should ensure that the impact of passive remedies is neutral for BT, i.e. whether BT services a new housing development or GTC serves the new development using passive access, the constitution to the fixed and common costs of BT's existing network should be broadly the same.
- 6.42 In relation to the scope for **incorrectly set prices to lead to inefficient decisions** the proposals set out above are designed to ensure that GTC faces the appropriate build and buy decisions when considering serving a new housing development.

- 6.43 In relation to *allocative efficiency* Ofcom considers that there is a risk that:
 - (a) BT would rebalance prices to recover costs differently from leased lines or other markets; or
 - (b) BT would recover costs differently from other markets.
- 6.44 On rebalancing, GTC does not serve the corporate user that could be affected by rebalancing of EAD prices if passive access were mandated, and as such this is not an issue for the remedies proposed by GTC.
- 6.45 While Ofcom considered in the 2013 BCMR statement that that BT's current bandwidth price gradient has efficiency properties, the evidence suggests that in the market where GTC is active BT's price gradient is *inefficient* as it restricts competition for new housing developments. An efficient structure of pricing would recover costs disproportionately from customers with lower price elasticity (as implied by the price gradient). However, the current price structure does not attempt to discriminate between different uses of leased lines services, and rather sets prices based on the demand of corporate users. This means that for customers such as GTC, in most cases it is unable to access leased lines services at a viable price.

Effectiveness of passive remedies if limited to particular product markets

- 6.46 As set out above, GTC is requesting a dark fibre access remedy that is suitable to be used 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. The dark fibre would be used in a point-to-point topology and will either be utilised:
 - (a) as 'Aggregation Backhaul' that GTC will typically run at speeds of up to 1Gbps, in a similar way to the EAD circuits that GTC currently purchases; or
 - (b) as 'Access Backhaul' that will form part of PONs currently running at speeds of up to 2.5Gbps.
- 6.47 A dark fibre remedy would be required in passive access product markets that serve both of these purposes, either:
 - (a) within a single market defined by end use, such as *'passive access for the purpose* of connecting new-build passive optical networks'; or
 - (b) defined separately, based on passive access for the provision of downstream services within particular speed segments.
- 6.48 Without access to dark fibre for both 'access' and 'aggregation' purposes as defined above, GTC would have significantly less flexibility to design optimum network architecture, and would not be able to pass on all of the significant benefits to consumers living in new homes that it believes they are entitled to. GTC will comment further on market definition in response to Ofcom's main consultation due to be published in Spring 2015.

Effectiveness of passive remedies if limited to particular geographic markets

6.49 If the dark fibre remedy is not imposed in geographic markets where Ofcom deems that neither BT nor KCOM have SMP, GTC expects to remain significantly less able to economically deploy its FTTP networks. Even in non-SMP areas, few OCPs will in reality have points of presence close enough to offer GTC cost-effective connectivity in all cases.

6.50 This could lead to a 'digital divide' between areas where new homeowners are able to secure the benefit of an FTTP connection, and areas where house holders continued to be connected to outmoded copper products. There is also a real risk that a remedy too artificially limited in reach and scope would reduce the potential for economies of scale amongst OCPs, due to them needing to design systems based on differing interconnectivity approaches in different parts of the country.

7. CHEAPER EAD IS NOT AN ALTERNATIVE SOLUTION

- 7.1 GTC does not consider that any active product is suitable to provide the connectivity needed to remedy the existing market failure in the construction of infrastructure for new homes.
- 7.2 The first issue is that an OCP would be **paying for service elements that it simply did not need**. Unnecessary costs are attributable to unwanted active equipment typically at the following four locations:
 - (a) at an OCP's OSCP;
 - (b) at the development side of BT's EAD connection
 - (c) at the exchange side of BT's EAD connection; and finally
 - (d) at the exchange.
- 7.3 An EAD remedy would also **impose inefficient network architecture** onto OCPs which raises costs in other ways. GTC's preferred architecture relies on the construction of GPON networks (which, as described in paragraph 5.22 above, is the approach taken by BT when it opts to construct an FTTP connection, rather than to use EAD). GPONs can convey data from homes in a given development over long distances. This means that data can be conveyed efficiently from a housing development over passive infrastructure to aggregate it at a point of handover, some way from the development. Traffic from different developments can be aggregated using a passive splitter. Then, at another appropriate point several developments can handover at single exchange in BT's network. This exploits the natural economies of scale of GPON networks so as to allow the associated CapEx and OpEx costs of GPON multiplexer equipment to be shared across a number of smaller developments. However, as described at paragraph 5.21 above, EAD cannot be used to construct GPONs and is therefore not suitable to construct an Access Backhaul solution.
- 7.4 EAD also has **technological limitations**. Backhaul solutions using active elements are more prone to faults than data conveyed over passive networks until a point of handover due to the additional liability to failure of active pieces of equipment. Also, EAD does not give the flexibility to offer new cost effective high-bandwidth services. IFNL would be able to utilise its technology of choice, evolving at its own rate and not constrained by BT's slower approach. For example, IFNL would be able to accelerate the adoption of NGA technologies such as XG-GPON 1, TWDM PON and WDM PON
- 7.5 The current pricing of EAD is inefficient as it means that in most cases it is only economically viable to connect larger sites of over 85 homes or so to the backhaul network (assuming an average ECC charge of £15k, which in GTC's experience is typical). However, even larger developments are required to reach a point of viability if, as is often the case, an OCP is required to procure an EAD Main Link from BT.

- 7.6 The economic annex explains in more detail that the current pricing structure of EAD, which recovers a relatively high level of BT's fixed and common costs, especially from higher bandwidth services, is not efficient when EAD is used for backhaul from housing developments. This is because the largely residential users in housing developments have a much lower individual willingness to pay, than corporate customers. Only where sufficient demand is from residential customers is aggregated on a single backhaul circuit is the total willingness to pay of the same order of magnitude as data connectivity to corporate customers (for example where EAD is used to provide connectivity directly to corporate customers' premises). It is notable that where a development served by GTC runs close to one of the small number of areas where GTC is able to access fibre backhaul services from a competitor such as Virgin Media or Vodafone, competitors offer a different price structure which reflects the number of end residential users served by the connection.
- 7.7 This mismatch between direct corporate connections, where there is a high willingness to pay, and a backhaul connection, aggregating demand from a number of mainly residential customers each with a relatively low willingness to pay, means that the current pricing structure for EAD will limit its use for smaller developments. Changes to the structure, such as a reduction in the tariff gradient for higher bandwidth services, would make the service suitable for a wider range of developments. However, unless the recovery of common costs is proportionate to the number of homes served, there will always be a cut-off point in terms of site size, below which EAD will not be viable.
- 7.8 EAD is inherently the wrong technology to facilitate downstream *ex ante* competition for the provision of infrastructure to new homes. If BT were asked to connect a new site at FTTP speeds, it would simply join the development to its local GPON network, which is significantly more cost-effective. BT's potential cost to developers becomes the competitive price, which GTC will never be able to match unless a passive dark fibre remedy is mandated.

8. ENHANCED DUCT ACCESS IS NOT AN ALTERNATIVE SOLUTION

- 8.1 GTC has studied the duct access remedy that was mandated by Ofcom under the most recent Fixed Access ("**WLA**") Market Review. This is not a remedy that is presently open to GTC to use because GTC requires a remedy within Business Connectivity markets.
- 8.2 However, GTC has considered the potential uses and limitations of such a remedy were it to be mandated under the BCMR. In short, whilst a limited number of developments might conceivably be able to utilise duct access, such a remedy on its own would fall significantly short of what is needed to secure true *ex ante* competition to provide infrastructure.
- 8.3 GTC's first concern is that duct access is an immature product within the BT portfolio, meaning many questions remain over its practical application. The relevant end-to-end processes have not been tested to any great extent. GTC is required to sign stringent Service Level Agreements ("SLAs") with developers. It would therefore be very difficult to start to utilise any duct access remedy that involved unpredictable timescales.
- 8.4 The bidding and construction processes supporting duct access are complex and slow. The maps needed to plan the sections from which access will be requested must be ordered by email. If the data corresponds to a route over 1km, the request needs to be made to BT's National Notice Handling Centre who will respond only on a 'best endeavours' basis.

- 8.5 Once the route information is obtained, the OCP then needs to make a request to survey the BT duct route. BT requires that it escorts approved contractors on certain parts of the network before any form of survey can be undertaken. This leads to further delay until a mutually free diary slot can be found.
- 8.6 Only then can an OCP make a detailed request for access, after which it must wait for BT to respond with a quote for the cost of providing that access. GTC consequently estimates that the time scale between first enquiry and actually receiving a quote which could be used in bids submitted to developers would be around 6-12 weeks under the current system.
- 8.7 Even post-inspection, an OCP does not have complete security that the space which appears to be in the duct is in fact available for use. BT's record are often incomplete, and GTC understands that particular lengths of duct can be subject to 'invisible reservations' which only become apparent after an OCP has placed a firm order. Ducts can also be damaged between inspection and attempted installation, which can add unexpected costs and delays.
- 8.8 This is entirely unworkable when set against the tight timetable that GTC and other OCPs are allocated to bid for connection projects by developers. GTC is usually given only four weeks within which to determine a project's viability, timescale and cost and to then submit a bid. Any bid where success is to be determined by duct access could not be prepared and submitted within the time available.
- 8.9 If GTC was to bid on an 'optimistic' basis, by *assuming* that duct access would be later available, but this in fact turned out not to be the case, this would either lead to:
 - (a) a financially unviable project, or
 - (b) GTC possibly breaching their contract with the developer, leading to reputational damage.
- 8.10 Neither outcome is a risk which GTC can take. However, even if GTC's practical concerns around duct access could be addressed, pricing would need to be set at a reasonable level.
- 8.11 In terms of protection against discrimination from BT, if GTC was required to rely solely on duct access there is a risk that absent an EOI requirement in this market, BT could strategically, or unintentionally, have advantages over competitors when providing developers with tenders containing plans and costs. This is because BT would have significant informational advantages compared to entrants who would not know the availability, quality and costs of suitable duct without a lengthy process of iterative requests for information and inspection. Therefore EOI requirements are particularly likely to be necessary to in the case if duct access remedies are solely available as a passive remedy.
- 8.12 Overall, whilst duct access might offer a solution in limited circumstances, it is very much sub-optimal to a dark fibre remedy. This would still be the case even if price and access conditions were reasonable and if BT could remedy the considerable procedural difficulties inherent in its current approach to the remedy. The only way that OCPs such as GTC would obtain the access that they need so as to drive connectivity improvement for new home owners, would be via a dark fibre passive remedy.

9. SUMMARY OF GTC RESPONSES TO OFCOM'S QUESTIONS

9.1 GTC has responded to each of Ofcom's questions in the body of this substantive response and the annexes. GTC therefore only briefly summarises its response to each question in this final section, together with cross-references to the more detailed sections of its response.

Question 1: Do you agree with our preliminary framework for considering the case for passive remedies?

9.2 GTC broadly agrees with Ofcom's framework for analysis and has responded to the consultation accordingly. In particular, GTC sets out the legal reasons why it considers it appropriate for Ofcom to assess the case for passive remedies under the BCMR rather than any fixed access market review in its Legal Annex.

Question 2: Do you agree with our preliminary views on the potential benefits of passive remedies? Please provide evidence to support your view.

- 9.3 Yes. Passive remedies would be hugely beneficial in accelerating innovation on the network (including allowing the optimisation of network design) and enhancing quality of service.
- 9.4 There could be wide-ranging benefits from creating a route for OCPs to cost-effectively interconnect fixed networks, and to provide enhanced service levels to users of those networks, following *ex ante* competition with BT.
- 9.5 GTC has commented on the benefits that could be brought to new households if it was granted passive access to provide them with FTTP connections at paragraph 4.5 above. The enhancements in network configuration that OCPs could realise from passive access so as to drive these consumer benefits, are set out at paragraphs 6.4 6.6 above.

Question 3: Do you agree with our preliminary views on the impacts and risks of passive remedies? Please provide evidence to support your view.

- 9.6 Tightly-defined remedies aimed at the specific market failures identified by GTC in this response will tend to have lower risks than broader remedies. As GTC has set out at Section 4 of its Economics Annex, many of the risks identified by Ofcom are not relevant to competition for connections to new housing developments. This is because BT would be able to continue to recover fixed and common costs from its existing customer base. Any wholesale dark fibre purchased by GTC would make a proportionate contribution to these costs, meaning there would be no need for BT to rebalance prices upwards for existing users.
- 9.7 However, even in the event Ofcom proposed a broadly-targeted remedy, GTC does not necessarily consider that the risks of passive remedies (such as the value of stranded assets) would be as significant as Ofcom appears to suggest. GTC has set out its initial thoughts on these issues in more detail at paragraphs 6.36 6.43 above.

Question 4: What are your views about the potential impact of passive remedies on the pattern of common cost recovery and the associated distributional impacts?

9.8 Please refer to GTC's response to Question 3.

Question 5: Do you agree with our initial view that mobile backhaul and fixed broadband backhaul are likely to be the primary applications with significant demand for passive remedies?

9.9 Yes. Although GTC is requesting a targeted remedy due to a specific market failure, it considers that this comprises a sub-segment of fixed broadband backhaul.

Question 6: What benefits might duct access offer over dark fibre and vice versa? Is there a case for having both remedies?

9.10 As set out at Section 8 above, GTC does not consider that duct access offers <u>any</u> benefits over dark fibre (at least for GTC's purposes). It therefore sees no purpose in both remedies being made available. If only one remedy can be mandated it should be dark fibre.

Question 7: If passive remedies were restricted to particular product types or geographic areas how might this affect the usefulness and benefits of the passive remedy?

- 9.11 Clearly, so long as Ofcom mandated the product that GTC is seeking to purchase from BT (and KCOM where appropriate) this would benefit consumers and would not be of concern to GTC if other use classes or product types did not secure a passive remedy. Of course, there may be certain efficiencies that other access-seeking OCPs could derive if the same remedy is made available for several purposes. Further information is set out at paragraphs 6.46 6.48 above.
- 9.12 If the dark fibre remedy is not imposed in geographic markets where Ofcom deems that neither BT nor KCOM have SMP, GTC expects to remain significantly less able to economically deploy its FTTP networks. Even in non-SMP areas, few OCPs will in reality have points of presence close enough to offer GTC cost-effective connectivity in all cases Further information is set out at paragraphs 6.49 6.50 above.

Question 8: What arrangements would be appropriate for the supply of new infrastructure for passive remedies?

9.13 GTC sets out the practical arrangements that would be required from BT in order to make a dark fibre access remedy workable, at paragraph 6.30 above.

Question 9: Do you agree with our initial views about the non-discrimination arrangements for passive remedies?

- 9.14 GTC agrees that Ofcom has identified the correct potential concerns when considering models of non-discrimination. As set out at paragraphs 6.31 6.35 above, in light of these concerns, GTC's view is that a 'no undue discrimination' obligation may be sufficient to work alongside a properly specified dark fibre product.
- 9.15 However, if the only passive remedy that is introduced is duct access, the concerns that GTC has expressed at Section 8 above concerning significant information asymmetries between BT and OCPs, coupled with a complex and delay-ridden process to secure access, mean that EOI requirements are likely to be necessary.

Question 10: In light of the trade-offs identified, which broad options on pricing do you consider would be most appropriate for passive remedies and why? Please also provide details if there is another pricing approach you consider would be appropriate in light of the considerations identified in this section.

9.16 GTC has set out a detailed assessment of the pricing model that it considers would be most appropriate for a dark fibre remedy at Section 3 of its Economic Annex. Essentially, GTC considers that it would be efficiency-enhancing to set a remedy which is specific to access

backhaul connectivity. If this was mandated, value-based pricing according to the number of ultimate customers of the backhaul service would be efficient and practical.

Question 11: If a value-based (active minus) approach to pricing dark fibre were adopted, what do you think would be an appropriate active wholesale product (or products) to reference?

9.17 GTC has set out in detail at Section 3 of the Economics Annex why dark fibre used for back haul from housing developments should be priced to recover the incremental cost of the fibre used along with a mark-up for common costs which reflects the Openreach's recovery of BT common costs for the relevant part of the network ("E-side") from services provided to consumers equivalent to those provided by GTC.

Question 12: Do you have any other comments on the issues raised in the document or comments that might aid our consideration of the passive remedies as a whole?

9.18 In addition to its responses to Ofcom's questions, GTC has made a number of observations in its main paper, as well as its Economic and Legal Annexes that are specific to GTC's perspective on the potential benefits of passive remedies. These comments provide Ofcom with a detailed explanation of precisely what GTC is seeking to achieve, why passive remedies are essential to that model and the benefits that GTC could bring to UK consumers as a result. Ofcom is urged to review these representations carefully.

GTC

5 January 2015