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Wholesale Local Access Market Review

Recovering the costs of investment in network expansion

CONSULTATION:

Publication Date: 9 August 2017

Closing Date for Responses: 27 September 2017

About this document

On 31 March 2017, we published a consultation on our WLA Market Review proposals for the future regulation of the market for the provision of local access services used to provide telephone and broadband internet services (including superfast broadband) to residential and business consumers. In this consultation, we also set out our proposals for charge controls for certain wholesale services.

The Department for Digital, Culture, Media and Sport has recently announced that it has received a proposal from BT to voluntarily roll out at least 10 Mbit/s universal broadband for the entire country by the end of 2020.

The Government will make a decision on the approach to universal broadband delivery following its consultation on the regulatory USO. This document sets out how we now propose to amend our charge control proposals in light of the additional relevant costs BT would incur, should BT enter into a clear and public agreement with Government committing BT to make the investment in universal broadband.

We have set a deadline of 27 September 2017 for responses to this consultation.

We will take responses to this further consultation into account before reaching our final conclusions and publishing our statement on the review in early 2018.

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Published separately

1. Executive Summary

Summary of proposals

1.1 Broadband and fixed telephone services typically rely on a fixed connection from the local telephone exchange or street cabinet to a home or business. In most areas there are only one or two physical networks that provide this. The wholesale services that supply this connection form the Wholesale Local Access (WLA) market.

1.2 On 31 March 2017, we published documents setting out our consultation proposals for the regulation of the WLA market from 1 April 2018.[1] This included proposals for charge controls for Local Loop Unbundling (LLU)(which is used to provide standard broadband services on Openreach's[2] copper network) and wholesale superfast services (known as Virtual Unbundled Local Access) provided by Openreach.

1.3 In our consultation, we set out our position that regulation in the WLA market should not be a barrier to commercial deployment that would deliver broadband to more difficult to reach areas. In particular, we set out our view that costs efficiently incurred in network expansion that provide customers with improved broadband services should be recoverable and taken into account in setting charge controls.

1.4 At the time of our March 2017 WLA consultation we did not have the necessary information on such network expansion, but said that, should relevant information on a committed rollout become available, we would consider any implications for the charge controls proposed in the WLA review.

1.5 On 30 July, the Department for Digital, Culture, Media and Sport (DCMS) announced that it had received a proposal from BT to voluntarily roll out at least 10 Mbit/s universal broadband for the entire country, by the end of 2020.[3]

1.6 If there is a clear and public agreement between BT and Government, committing BT to investment in network expansion to deliver its offer, we propose to allow BT to recover relevant efficient costs of this investment through an increase to the charges for broadband lines supplied in the WLA market. Based on the analysis set out in this consultation document, under our proposals the following amounts would be included in the relevant charge controls.

Table 1.1: Proposals for an additional charge

Range and (central estimate)	Proposals for annual charges (£ – nominal)		
	2018/19	2019/20	2020/21
Additional cost for network expansion	£0.23 to £1.57 (£0.39)	£0.71 to £3.80 (£1.19)	£1.14 to £5.89 (£1.93)

[1] https://www.ofcom.org.uk/consultations-and-statements/category-1/wholesale-local-access-market-review
[2] Openreach provides services related to the access network.
[3] https://www.gov.uk/government/news/universal-broadband-to-reach-every-part-of-the-uk

BT's proposal for delivering universal broadband

1.7 The announcement by DCMS sets out that BT's proposal would deliver:

- 10 Mbit/s download speeds and 1Mbit/s upload speeds;
- Quality requirements to minimise delays from contention and latency;
- BT proposes to use a mix of technologies to deliver this.
- Fixed coverage would be made available to as many premises as possible, with 99% fixed coverage by the end of 2020.
- Fixed wireless on demand and satellite will be used in the remainder of the country, with satellite. The number of premises that will only have satellite as an option is expected to be 0.3% by the end of 2022.

1.8 The Government will work with BT to develop its proposal over the coming months. DCMS has also published a consultation seeking views on the design of a regulatory USO. The closing date for responses to this consultation is 9 October 2017.

1.9 The Government will now consider BT's offer alongside a consultation on a regulatory USO. If Government were to decide to proceed with BT's proposal, BT would incur costs relevant to the WLA charge control.

Our assessment of the relevant costs

1.10 To fulfil its commitment to reach 99% coverage, BT proposes to extend the coverage of its fibre access network, and to provide access to this new rollout to telecoms providers through services provided in the wholesale local access market.

1.11 As the capital costs associated with this network expansion will be incurred and services provided in the expanded area in the period covered by our market review proposals, we consider it is appropriate to reflect these costs in the WLA charge controls in order to allow BT the opportunity to recover its efficiently incurred costs.

1.12 BT also proposes to deliver at least part of its commitment using fixed wireless and satellite technologies. We do not consider the costs of these technologies to be relevant for the charge controls.

1.13 In our December 2016 report providing technical advice to UK Government on universal broadband ('The USO Report') we estimated that there were around 2.6 million homes and businesses that could not get broadband, at the 10 Mbit/s specification now envisaged in BT's proposal, and that with ongoing rollout this would reduce to around 1.8 million by the end of 2017 and to around 600,000 by the early 2020s.[4] With new premises level data we now estimate that with ongoing commercial and state-sponsored rollout from current

[4] Ofcom December 2016. Achieving decent broadband connectivity for everyone. https://www.ofcom.org.uk/__data/assets/pdf_file/0028/95581/final-report.pdf

programmes, the number of homes and businesses that will not be able to get this 10 Mbit/s specification by March 2021 would be around 785,000.

1.14 Future broadband initiatives planned by the Devolved Administrations of Scotland, Wales and Northern Ireland, aimed at increasing the proportion of the population with access to superfast and ultrafast broadband, may further reduce the number of homes and business unable to get 10 Mbit/s. We plan to discuss these plans with the Devolved Administrations and to update our analysis with this and any new information for final decision in early 2018.

1.15 In line with BT's proposal we have estimated the mixture of technologies that would deliver, at the lowest cost, the 10 Mbit/s specification through WLA services to nearly 99% of UK homes and businesses, and the associated cost in each year of the proposed charge control.

Impact on proposed WLA charge controls

1.16 We propose that the costs for this deployment (i.e. excluding those for fixed wireless and satellite, for the reasons explained above) should be recovered across all of the wholesale broadband lines supplied in the wholesale local access market by BT[5] nationwide.

1.17 Our proposed approach is to ensure that the costs relating to BT's network expansion are only recovered once from each broadband line (including Openreach broadband lines not subject to a charge control). To implement this, we propose to change the structure of the charge controls proposed in our March 2017 WLA Consultations. In that consultation we proposed to charge control:

- Metallic Path Facility (the form of LLU used by a telecoms provider to offer both broadband and voice services over the line to its customers); and
- Generic Ethernet Access 40/10 (the VULA product that provides up to 40 Mbit/s download and up to 10 Mbit/s upload and used by telecoms providers to offer superfast services).

1.18 We propose changing the legal instrument so there are separate charge controls for the annual rental of GEA 40/10 when (i) it is purchased with MPF and (ii) when it is not purchased with MPF. Under our proposals the same level of additional costs would therefore be added to the charge controls for broadband lines using MPF only, MPF+GEA, and WLR[6]+GEA.

1.19 These proposed changes to our charge control proposals would only be implemented should BT enter into a clear and public agreement with Government committing BT to make the investment in universal broadband.

[5] This includes lines provided by BT in Northern Ireland where Openreach does not operate and lines provided by Openreach in the rest of the UK.
[6] WLR: Wholesale Line Rental.

Next steps

1.20 We invite comments from stakeholders on the proposals in this consultation, including our proposed means of implementation, and the impact of these proposals on the proposals we set out in our March 2017 WLA Consultation. The deadline for responses is 27 September 2017.

1.21 The proposals set out in this consultation form part of our overall proposals for the WLA market. We have not at this stage taken any decisions in relation to the proposals set out in our March 2017 WLA Consultation. We are currently considering consultation responses and will take account of these responses in our final decision. We therefore invite comments from stakeholders on the proposals in this consultation and their impact on our March 2017 WLA proposals and not on the broader proposals set out in our March 2017 WLA Consultation.

1.22 We expect to publish our final decision in a statement in early 2018, with new measures taking effect on 1 April 2018. The statement will set out relevant markets, our determinations as to SMP and, if relevant, any remedies – including how Ofcom decides to take account of any relevant costs BT may incur as a result of a clear and public agreement that commits BT to additional rollout.

2. Introduction

Overview of our general approach

2.1 Where costs are efficiently incurred in providing WLA services, we propose to allow BT the opportunity to recover relevant costs through the charge controls we impose. The proposals in this document are premised on there being certainty that investment would be made as a result of a clear and public agreement between BT and Government committing BT to make the investment in network expansion. If there is no such certainty at the time of taking our final decision, we would not include these costs in the charge controls.

2.2 BT estimates its proposed network expansion to provide a 10 Mbit/s service would result in an investment of between £450 million and £600 million.[7] This would result in a cost per premises passed broadly in line with our estimates in the USO report.[8]

2.3 Whilst the figures in the USO Report suggest BT's estimates may reflect a reasonable level of costs, the analysis in the USO Report was carried out for a different purpose. Therefore, we have carried out an additional analysis to estimate the costs that we would expect to be recovered in the WLA charge control, should BT commit to the proposed rollout. In this analysis we have estimated:

- the number of premises that would still be unable to achieve the 10 Mbit/s specification set out in BT's proposal by the end of the proposed WLA charge control in March 2021 following the completion of current state sponsored programmes and ongoing commercial rollout (we refer to these as the qualifying premises);
- the technology mix that Openreach would deploy to increase coverage of fixed network technologies to 99% of premises; and then
- the additional costs that Openreach would incur in that deployment and the timing of those costs.

2.4 In each of these steps we have made assumptions that are subject to some uncertainty. We have therefore considered different scenarios for the number of qualifying premises, the ability of each technology option to deliver the specification and the costs associated with each technology, and the deployment schedule. These scenarios inform a range of estimates of the level of costs to be recovered in each year, and our central case scenario within that range.

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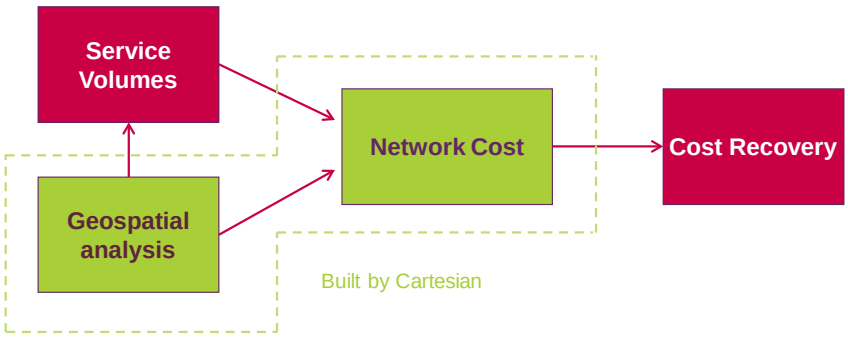
[7] https://www.gov.uk/government/news/universal-broadband-to-reach-every-part-of-the-uk

[8] BT estimates it would cover around 750,000 premises, with around 1% (or 300,000) covered via wireless. The costs of wireless technologies are not included in the £450-£600 million. This gives a cost per premises passed by fixed technologies of around £1,000-£1,333. The USO report forecasts around 600,000 premises by 2020 would not receive the service proposed by BT, and that covering these would cost around £1bn, giving a cost per premises passed of £1,666. However, this includes the most expensive premises. The USO Report highlights that, as of 2016, the final 1% of premises are likely to cost £690 million. Assuming the same premises and costs represent the final 1% in 2020, removing these premises and costs from the USO Report's 2020 forecast leaves 320,000 premises costing £310 million, or just under £1,000 per premises passed.

2.5 We have then considered whether costs should be recovered from all Openreach lines, all Openreach broadband lines, or a subset of Openreach broadband lines (specifically those used to provide superfast broadband services). We propose to recover costs over all Openreach broadband lines and have allocated the projected costs to relevant WLA services. For those services subject to our proposed charge controls, we propose an addition to the relevant charge control.

2.6 In order to undertake this analysis we have developed a model which comprises four modules, two of which have been developed by Ofcom ('Service volumes' and 'Cost recovery'), with the other two ('Geospatial analysis' and 'Network cost') being developed by external consultants, Cartesian. The module structure for the model is shown in Figure 2.1 below.

Figure 2.1: Module structure



2.7 Each module is responsible for the following:

- **Geospatial analysis** – determines the optimal mix of technologies to deliver the service specification to the qualifying premises.
- **Service volumes** – uses outputs from the Geospatial analysis to determine the volumes of each relevant service (e.g. number of connections and rentals) in each modelled year.
- **Network cost** – calculates the capital and operating expenditure required to build and operate the dimensioned access network.
- **Cost Recovery** – uses the outputs from the Network cost module to calculate the unit costs to be recovered across all broadband customers over time.

2.8 We have used a number of data sources to support our analysis, including:

- **Ofcom's December 2016 USO study, and associated report from Analysys Mason**: provides network and cost assumptions, including the engineering rules for, and unit costs of Fixed Wireless Access (FWA) and a view of future rollout that would reduce the number of premises eligible for universal broadband rollout;
- **2016 Connected Nations ('CN 2016')**: provides data on the number and location of qualifying premises, as well as the network connecting these premises, as further explained in Section 4 and Annex 10;
- **2017 WLA charge control bottom-up model**: provides some of the network and cost assumptions in the model to inform the VDSL related costs of the necessary network rollout;

- **BT Chief Engineer's Model ('BT Model')**: provides additional detail on network costs, for example for FTTP; and
- **DCMS' announcement of BT's proposal to deliver universal broadband**: provides information on the services to be provided and rollout timeframes. We have also obtained additional information from BT using our statutory information gathering powers on its analysis of the number of premises to be served, the technologies to be used and the timescales of rollout.

2.9 This consultation sets out the approach we have taken for each stage of the modelling summarised above and has used the best data currently available to us. We plan to update and further refine the data on which we base our assessment for our statement. We explain in the rest of this document where we expect to update data, and any changes to approach that may follow from this updated data.

Regulatory Framework

2.10 The regulatory framework for market reviews is set out in UK legislation and is transposed from five EU Directives. These Directives impose a number of obligations on relevant regulatory authorities, such as Ofcom, one of which is to carry out periodic reviews of certain electronic communications markets.

2.11 We have set out the relevant regulatory framework in our March 2017 WLA Consultation and reference should be made to that document for further detail.[9]

Impact Assessment and Equality Impact Assessment

Impact Assessment

2.12 The analysis presented both in the March 2017 WLA Consultation and in this consultation constitutes an impact assessment as defined in section 7 of the Act.

2.13 Impact assessments provide a valuable way of assessing the options for regulation and showing why the chosen option was preferred. They form part of best practice policy-making. This is reflected in section 7 of the Act, which means that, generally, we have to carry out impact assessments in cases where our conclusions would be likely to have a significant effect on businesses or the general public, or where there is a major change in Ofcom's activities. However, as a matter of policy Ofcom is committed to carrying out impact assessments in relation to the great majority of our policy decisions.[10]

[9] We set out the applicable regulatory framework and the approach to market definition and SMP assessment in more detail in Annexes 5 and 6 of the March 2017 WLA Consultation.

[10] For further information, see Ofcom, 2005. *Better Policy Making: Ofcom's approach to Impact Assessment*, https://www.ofcom.org.uk/__data/assets/pdf_file/0029/45596/condoc.pdf.

Equality Impact Assessment (EIA)

2.14 Annex 7 of the March 2017 WLA consultation sets out our EIA for the WLA Market Review. Ofcom is required by statute to assess the potential impact of all our functions, policies, projects and practices on race, disability and gender equality. EIAs also assist us in making sure that we are meeting our principal duty of furthering the interests of citizens and consumers regardless of their background or identity.

2.15 It is not apparent to us that the outcome of our review (including the revised proposals set out in this consultation) is likely to have any particular impact on race, disability and gender equality. More generally, we do not envisage the impact of any outcome to be to the detriment of any group of society. Nor do we consider it necessary to carry out separate EIAs in relation to race or gender equality or equality schemes under the Northern Ireland and Disability Equality Schemes.

Scope of this document

2.16 The focus of this consultation is on the detail of our proposal to include Openreach's efficiently incurred costs associated with delivering its offer for universal broadband in our proposed WLA charge controls. We are not consulting on the specifics of BT's proposal to Government for a universal broadband as that is a matter to be agreed between BT and Government.[11]

2.17 We do not repeat, in this document, our description or reasoning relating to the full set of March 2017 WLA Consultation proposals and do not seek responses to those proposals. Instead, we set out specific revisions on which we are seeking further responses.

Document Structure

2.18 This remainder of this document is structured as follows:

- Section 3 – Identifying Qualifying Premises
- Section 4 – Assessing the technology mix
- Section 5 – Approach to Cost Modelling
- Section 6 – Approach to Cost Recovery
- Section 7 – Impact on WLA Charge Control Proposals

2.19 We have also published a number of annexes alongside this document, these provide additional analysis and guidance on responding to this consultation.

2.20 The Annexes are structured as follows:

- Annex 1 – Responding to this consultation
- Annex 2 – Ofcom's consultation principles
- Annex 3 – Consultation Coversheet

[11] https://www.gov.uk/government/news/universal-broadband-to-reach-every-part-of-the-uk

- Annex 4 – Consultation questions
- Annex 5 – Legal Instruments
- Annex 6 - Volume impacts
- Annex 7 – Indirect benefits
- Annex 8 – Model cross-checks, results and sensitivities
- Annex 9 – Glossary
- Annex 10 – Cartesian report

3. Identifying qualifying premises

Introduction

3.1 In this section we:

- set out the general characteristics of the service in BT's proposal to Government;
- describe the approach we have adopted to identifying the number of premises in the UK that were not able to access this level of service as of June 2016; and
- estimate the number of 'qualifying premises' that will remain unable to access this level of service by the end of the WLA market review period (i.e. March 2021) taking account of expected future rollouts by BT and others.

3.2 We use this estimate of qualifying premises to determine the network that BT would need to deploy and the costs of that deployment, as discussed in the following sections of this consultation.

Overview of the service BT is proposing to roll out

3.3 The proposed service characteristics are:

- Download speed: the bandwidth from the network to the customer is a minimum of 10 Mbit/s;
- Upload speed: the bandwidth from the customer to the network is as a minimum of 1 Mbit/s;
- Delays due to contention and latency should be minimised; and
- Use of satellite will be minimised, with fixed broadband technologies covering 99% of premises.[12]

3.4 For the purposes of our analysis we have also included a Committed Information Rate (CIR). The CIR is the minimum bandwidth each customer is able to use during the busiest period of customer usage. The network needs to be configured so that it has sufficient capacity to ensure each customer can use at least as much bandwidth as the CIR. A CIR can be specified for transmission both download and upload, but for the purposes of our analysis we have only included a CIR for the download direction, at 1.5 Mbit/s.[13] We have taken this approach as a proxy for configuring a network to meet the proposed characteristics of minimising contention.

[12] https://www.gov.uk/government/news/universal-broadband-to-reach-every-part-of-the-uk

[13] A CIR of 1.5 Mbit/s in the download direction and no CIR in the upload direction matches that of Scenario 2 in Ofcom's December 2016 USO report.

3.5 Each of the candidate network technologies that BT is proposing to use to fulfil its proposed commitment can offer a standard of service that meets or exceeds the performance characteristics listed in paragraph 3.3, with the exception of satellite. Due to the limits of the technology, BT proposes that satellite broadband will meet the specified download speed but not the other criteria.

3.6 We use this service specification to assess the number of qualifying premises and in our assessment of the technologies that will be able to provide the required service at each qualifying premises.

Identifying the number of qualifying premises

3.7 Our aim is to estimate the number and geographic characteristics of qualifying premises and to use these estimates to determine the network that BT would need to deploy to provide the specified service and the costs it would incur in doing so. In identifying the qualifying premises we need to take into account future network rollout so that we do not include costs related to BT rolling out a network to provide the proposed service in places where other network rollout will be able to provide it.

3.8 For the Ofcom Connected Nations 2016 report[14] we gathered data from telecoms providers on the services (in terms of download and upload speeds) they could provide to premises within the footprint of their networks. We used this data in the USO Report we provided to Government in December 2016 in which we set out our advice on delivering better broadband to customers in the UK.[15] In the USO Report we estimated that 2.6m premises were not able to receive a service with the characteristics of the one in BT's proposal.[16] We also forecast that, by around 2020, approximately 600,000 premises would not receive the proposed service specification of at least 10 Mbit/s.

3.9 We have revisited our forecasts for this modelling exercise. We have considered whether we could use updated data provided for the Connected Nations 2016 report, which telecoms providers gave us at a per-premises level, to forecast the premises that would not receive the required service by the end of the WLA charge control. However, this data does not capture any future rollout.

3.10 Therefore, we have considered activities that are likely to rollout by the end of the WLA charge control in March 2021 in order to produce our forecast.

3.11 We have first considered Broadband Delivery UK (BDUK). BDUK is part of the Department for Digital, Culture, Media and Sport (DCMS) and is responsible for implementing the Government's publicly funded delivery programme on superfast broadband.[17] BDUK's

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[14] https://www.ofcom.org.uk/__data/assets/pdf_file/0035/95876/CN-Report-2016.pdf

[15] Ofcom, 16 December 2016. Achieving decent broadband connectivity for everyone: Technical advice to UK Government on broadband universal service, Figure 4.3, Scenario 2, https://www.ofcom.org.uk/__data/assets/pdf_file/0028/95581/final-report.pdf.

[16] This data was analysed at postcode level.

[17] https://www.gov.uk/guidance/broadband-delivery-uk .

forecasts relate to the number of premises which, in total, will be able to receive a superfast broadband service.[18] Any line that receives such a superfast broadband service would therefore be able to receive a service at least equal to the 10 Mbit/s specification proposed by BT.[19] This means premises considered to receive a superfast service by BDUK should be excluded from our list of qualifying premises.

3.12 The BDUK forecast takes into account rollout not only under the specific BDUK funding scheme, but also rollout by other telecoms providers on a commercial basis, to calculate the total UK premises able to receive a superfast broadband service.

3.13 BDUK rollout has been implemented in a number of phases. BDUK reported that 90% of UK premises were able to receive a superfast broadband service when Phase 1 was completed around the middle of 2016.[20] BDUK Phase 2 aims to extend superfast coverage to 95% of UK premises by the end of 2017.[21] In addition, whilst there are currently no formal forecasts of further rollout under the BDUK programme, there are expectations that further deployment will take place through the completion of the Phase 2 projects, re-investment of efficiency savings and take-up clawback[22], other additional public funding, and further commercial rollout.[23] We do not have a committed figure for this rollout but for the purpose of our analysis we have assumed that an additional 2% of premises could be covered by 24 Mbit/s superfast broadband by the end of 2020.[24] We take this to be a reasonable proxy for coverage by the end of the WLA charge control period in March 2021.

3.14 In total, therefore, we estimate that by the end of the WLA charge control period, 97% of UK premises will have access to at least 24 Mbit/s speeds. This includes further rollout under programmes such as Virgin Media's Project Lightning and deployment by other telecoms providers.

3.15 In our WLA charge control model we forecast that there will be 29.09 million premises in the UK by 2020/21.[25] The premises not covered by 24 Mbit/s superfast broadband at this time (3%) would therefore be 873,000. We take this to be the likely upper limit of premises that would be targeted by BT's network expansion.

3.16 There will be some premises that will not receive 24 Mbit/s but will have access to speeds that meet the proposed service specification of at least 10 Mbit/s. Based on BDUK data, in June 2016 around 10%, or 2.9m premises, did not have access to 24 Mbit/s. Comparing this to our Connected Nations data for the same time, where 2.6m premises did not have

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[18] In this context 'superfast broadband' refers to speeds of at least 24 Mbit/s, which is the Government's definition of superfast broadband.
[19] We assume that where a customer can receive 24 Mbit/s download they would also be able to receive at least 1 Mbit/s upload.
[20] http://researchbriefings.files.parliament.uk/documents/SN06643/SN06643.pdf - page 9
[21] http://researchbriefings.files.parliament.uk/documents/SN06643/SN06643.pdf - page 12
[22] Clawback is a mechanism within the BDUK process whereby BT repays some of the initial public funding when certain conditions such as take-up exceed a given level.
[23] http://researchbriefings.files.parliament.uk/documents/SN06643/SN06643.pdf - page 14
[24] See for example House of Commons Briefing Paper CBP06643, page 15.
[25] WLA Charge Control 'Volumes Module' https://www.ofcom.org.uk/__data/assets/file/0032/99644/Published-Consultation-Models.zip

access to the 10 Mbit/s specification in BT's proposal, this implies that around 90% of those that did not have access to 24 Mbit/s also did not have access to 10 Mbit/s. We have assumed this ratio of availability of 24 Mbit/s and 10 Mbit/s remains broadly constant, so based on our forecast that by 2020/21 873,000 premises would not have access to 24 Mbit/s, at this time some 785,000 premises would also not have access to 10 Mbit/s and would therefore be qualifying premises in March 2021.

3.17 BT is also undertaking a programme to migrate customers from its ADSL-based IPStream product, which only supports a maximum download speed of 8 Mbit/s, to its ADSL2+-based Wholesale Broadband Connect (WBC) product, which supports a maximum download speed of 24 Mbit/s.[26] It Is unclear how many qualifying premises will be affected by this programme but we expect it to be small. This is because the premises that benefit are likely to be those that are also most likely to be in BDUK areas, therefore we have not included it in our forecast.

3.18 We have also considered rollout under public funding schemes in Scotland, Northern Ireland and Wales.[27] Rollout expected to contribute to achieving 95% UK coverage (as per the aims of BDUK Phase 2), and further rollout to 97%, is included as part of our forecasts above. We have not included specific rollout beyond this.[28]

3.19 We have checked our forecast against BT's view of the number of qualifying premises. BT has considered similar impacts as those discussed above. It has based its view on the impact of future rollout under BDUK schemes on Openreach's planned network rollout, and has then taken a view of rollout by other telecoms providers and the impact of BT Wholesale's migration from IPStream to WBC. BT's analysis indicates approximately 750,000 qualifying premises would need to be included in this assessment.

3.20 Our forecast is broadly similar to BT's, taking account of the same expected impacts. Therefore, for the purposes of this consultation our forecast is 785,000 qualifying premises. We set out below how we expect to update this forecast for the statement.

Approach to updating premises forecasts

3.21 For the statement, we will start from the basis of the data collected for our Connected Nations 2017 report. This data will have been collected in mid-2017. We expect that coverage of superfast broadband included in the Connected Nations 2017 data will have increased materially as BDUK Phase 2 and Virgin Media's Project Lightning will have rolled out further, so that the number of premises not able to receive the 10 Mbit/s service in BT's proposal is likely to have reduced significantly.

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[26] Ofcom, Wholesale Broadband Access Market Review consultation, 22 June 2017 https://www.ofcom.org.uk/consultations-and-statements/category-1/wholesale-broadband-access-market-review, Para 2.9

[27] https://www.scotlandsuperfast.com/#, http://nibroadband.com/, https://beta.gov.wales/go-superfast/what-is-superfast

[28] For example, the Reaching 100% (R100) in Scotland where the Scottish Government intends to conduct an open procurement for the purpose of delivering superfast broadband to 100% of premises in Scotland. http://www.gov.scot/Resource/0052/00522212.pdf

3.22 We also plan to gather updated data on rollout forecasts from BT and Virgin Media as part of our WLA review, and will use any further data available under the BDUK scheme, any further detail on plans in the Devolved Administrations and any other appropriate data sources available to inform our forecasts for the statement.

Question 3.1: Do you agree with our approach to assessing the number of qualifying premises to include in our analysis? Please provide reasons and evidence in support of your views.

4. Assessing the technology mix

Introduction

4.1 A number of access network technologies are capable of satisfying the requirements of the service specification in BT's proposal. In this section we explain the process we have followed to identify the mix of technologies that we are proposing to use to calculate the costs of making this service available to the 785,000 qualifying premises identified in Section 3.

4.2 To support this aspect of our proposals external consultants, Cartesian, have undertaken this analysis on our behalf. The report prepared by Cartesian is available at Annex 10 and reference should be made to that document for a full description of the approach taken. We have set out a summary below.

Overview of our approach

4.3 In our March 2017 WLA consultation we based our fibre charge control proposals on the costs of an efficient fibre access network operator, using FTTC/VDSL2. We proposed that FTTC/VDSL2 was the modern equivalent asset (MEA) for modelling the costs of a national efficient fibre network operator that delivers SFBB services with speeds of up to 40/10 Mbit/s.

4.4 For this aspect of our proposals, however, we are interested in estimating the costs of a broadband connection that is capable of meeting the service specification proposed by BT, and not a service that can deliver speeds of up to 40/10 Mbit/s.

4.5 This means that for some premises, the technology identified as the MEA for areas of the UK subject to commercial rollout (i.e. FTTC/VDSL2), may not be technically able to deliver the level of service in BT's proposal, or may not be the least cost means of doing so. Consequently, we believe it is appropriate to adopt a technology approach that specifically considers the service characteristics outlined in BT's proposal, rather than rely on the approach that we have taken in the March 2017 WLA Consultation.

Approach to assessing the costs

4.6 There are a number of candidate access network technologies that can, in principle, satisfy the requirements of the proposed service specification. However, each is best-suited to certain locations, based upon local factors such as the natural environment, the built environment and the number and distribution of end customers. Not all technologies can necessarily provide the proposed service specification in all locations. Each technology also has a different cost structure.

4.7 In this consultation, we are interested in identifying the choice of technology in order to derive the level of costs it is reasonable to allow BT to recover through the proposed WLA charge controls. However, our SMP regulation, including the charge controls, do not

impose specific technology rollout obligations on BT. As such, subject to any agreement with the Government, BT would not be constrained in the mix of technologies it uses. Including higher costs where cheaper technologies would also be capable of meeting the required specification would carry the risk of allowing BT over-recovery.

4.8 Therefore, we have sought to determine the technology, or combination of technologies, that minimises the costs of deploying and operating BT's network expansion, while at the same time delivering the required service specification. We believe that this approach is consistent with our principle of modelling an efficient network operator, as set out in our March 2017 WLA Consultation.

4.9 To identify the least cost technology, one method would be to approach it as an investment appraisal, by taking the net present value (NPV) of the expected cash costs, comparing it across technologies, and choosing the technology with the lowest NPV. However, this approach would raise practical issues given that the network assets involved in delivering BT's network expansion have widely varying lives, some of which exceed the length of the modelling period (see section 5).

4.10 A simpler method which would not require a long modelling period, whilst capturing the varying lives of different assets, is the tilted annuity approach. This approach aims to calculate the annualised payment that would enable an investor to recover its investment over the life of the underlying assets, taking into account the expected discount rate and the price evolution of assets. We consider this approach to be an appropriate proxy of the discounted cash flow method. In the USO Report we used the tilted annuity approach to identify the optimal combination of technologies for a potential broadband USO network. We propose to apply the same approach here. Further details on the implementation of this approach are provided in Annex 8.

Using geospatial analysis to identify technology choices

4.11 In order to determine the technologies that would be used in an efficient network deployment, Cartesian has carried out a geospatial analysis. Geospatial analysis uses the location data of each customer premises and key network elements to determine the optimal technology with which to serve these premises, based on the length of the line from the relevant network node (exchange, cabinet or other node)[29] and the density of premises that can be served by each deployment.

4.12 Based on the data available to us, we have the locations of the specific premises not receiving the required service as of mid-2016 from the Connected Nations 2016 report. However, we do not have the specific locations of the qualifying premises when our forecasts (discussed above in paragraphs 3.7 to 3.20) are taken into account as this is not

[29] Given that telephone lines tend to follow the layout of streets, rather than travel in straight radial lines from exchanges to street cabinets and onto customer premises, the derived radial distances are converted into route distances that follow the typical rectilinear pattern of streets by applying a conversion factor (typically in the range 1.2 – 1.4).

known at the present time. In order to carry out a geospatial analysis on our forecast number of premises, we could make assumptions about the specific premises included in future rollouts. However, at this stage we have instead carried out a geospatial analysis on all premises included in the data collected for the Connected nations 2016 report and subsequently applied adjustments to take account of the reduced number of eligible premises in our forecast.[30]

4.13 For the Ofcom USO Report we used data aggregated at the postcode level. However, we gathered data from telecoms providers on a per premises basis. Where telecoms providers were able to supply a service (or a number of services using different network technologies) but did not actually provide service, they provided estimates of the download and upload speeds that might be achieved. Because the performance of services provided over copper lines can be variable, telecoms providers using copper lines provided estimates with a range of speeds, based on the speeds achieved by other lines with similar characteristics.

4.14 Based on the data provided by telecoms providers there are two scenarios:

- Optimistic - telecoms providers were asked, for each line, to estimate the maximum speed that at least 20% of existing customers on services with similar lines and similar services might receive;[31] and
- Conservative - telecoms providers were also asked to estimate the maximum speed that at least 80% of customers with similar lines and services might receive.

4.15 Cartesian has carried out a geospatial analysis using both of these scenarios. Taking the Connected Nations 2016 data, Cartesian has removed premises likely to be covered by future rollout by Openreach and premises for which there was missing data.

4.16 Table 4.1 below shows the number of premises included in the geospatial analysis for both the optimistic and conservative scenarios once the adjustments have been applied.

Table 4.1 Premises included in the geospatial analysis[32]

	Optimistic (20th percentile)	**Conservative** (80th percentile)
Premises included in the geospatial analysis	**2,369,665**	**3,884,154**

[30] We have combined this information with premises location data taken from the Ordnance Survey (OS) AddressBase to obtain the location of each of the premises.
[31] For example, in the case of a customer that currently has standard broadband based on ADSL, telecoms providers that didn't currently serve the customer but could do so were asked to estimate the speed the customer would receive. For services that are delivered partially or wholly over copper lines, for example, FTTC based superfast broadband services, the telecoms provider provided the optimistic and pessimistic estimates based on the speeds experienced by existing FTTC customers with lines with similar characteristics.
[32] See Figure 24 of the Cartesian report in Annex 10.

4.17 The output of the geospatial analysis is the mix of technologies that gives the lowest cost (as determined using the tilted annuity approach explained above) to deploy a network to make available the required service to the premises identified as not having access to that service in the Connected Nations 2016 data.

4.18 We have then made an adjustment to reduce these costs to take into account the reduced number of premises in our forecast.

Technologies considered in our analysis

4.19 We provided Cartesian with a list of technologies that we expect may be used by BT in its deployment, specifically:

- VDSL2 over FTTC – the broadband equipment (the DSLAM) is located at the street cabinet. The customer connects to the DSLAM using copper wires; the DSLAM is then connected back to the local exchange using fibre. The DSLAM uses the VDSL2 standard to transmit and receive broadband signals to the customer equipment;
- Long Reach VDSL (LR-VDSL) over FTTC – uses the same network as VDSL2 over FTTC, but changes to the way the signals are transmitted and received between the DSLAM and the customer equipment can increase the speeds experienced by the customer;
- G.Fast – the broadband equipment is located either at the street cabinet or in a location closer to the customer than the cabinet. The final connection to the customer is provided over copper wires. The G.Fast technology standard allows much higher transmit and receive speeds than are possible over VDSL2 but these higher speeds are only likely to be achieved over shorter distances;
- FTTP – the customer is connected to the network using fibre, allowing much higher speeds which are not distance limited in the way that copper lines are;
- Fixed Wireless Access (FWA) - the connection between the network and the equipment located at the customer premises is provided over the radio access medium; and
- Satellite - the connection between the network and the equipment located at the customer premises is provided via a satellite link.

4.20 Cartesian's report discusses each of these technologies and the assumptions they have used in modelling them (see Annex 10).

4.21 Openreach is currently trialling the use of LR-VDSL technology and the large-scale operationalisation of the technology has yet to be achieved. This means the assumptions used by Cartesian in the geospatial analysis in relation to the effectiveness of LR-VDSL are based on limited information and the effectiveness of this technology is subject to some risk.

4.22 Furthermore, LR-VDSL is incompatible with earlier variants of DSL, in particular ADSL, ADSL2+ and SDSL. If a street cabinet is upgraded to offer LR-VDSL as part of any rollout programme, any customers with DSL services would need to be migrated to services provided from the cabinet using LR-VDSL, and no new ADSL/ADSL2+/SDSL services could be provided in that cabinet area. In the March 2017 WLA consultation we said that where customers are forced to migrate from these products because of the use of LR-VDSL, we

would expect BT to offer a replacement product of similar quality of service at no extra charge to allow customers that did not wish to upgrade to superfast broadband to be migrated.[33] Therefore, in using LR-VDSL, the costs need to take into account not only those related to the premises not able to receive the required service, but also the costs related to migrating all customers on the cabinet onto LR-VDSL based products.[34] There may be a range of costs that we have not considered or included in our analysis but which are a cost of using LR-VDSL. These include systems development required by other telecoms providers to use services provided by Openreach via LR-VDSL (which may mean some telecoms providers need to develop the capability to use Openreach fibre systems for the first time where they have only used copper services to date), costs of project management in Openreach and other telecoms providers in liaising to ensure customer migration is effectively managed, and costs related to the reduced usage of LLU (for example, the costs of ceasing and removing tie cables). Openreach has consulted on the issues surrounding the use of LR-VDSL and is considering responses to that consultation.

4.23 We will also consider the use and implications of LR-VDSL in the WLA statement based on responses received to the March 2017 WLA consultation and this consultation.

4.24 Given the uncertainty outlined above, in the geospatial analysis we have considered the outcome if LR-VDSL is used and, alternatively, if it is not used.

4.25 In addition, some of the lines not currently able to receive the required service specification may be Exchange Only (EO) lines (i.e. lines which connect the customer directly to the exchange without going via a cabinet). There may be a number of ways of serving these lines. Cartesian has modelled these lines by assuming these lines can be served by a cabinet adjacent to the serving exchange.

4.26 Following further discussion with BT, we understand it may, in addition, use a Fibre To The Remote Node (FTTRN) approach for some of its proposed roll out. Whilst we initially took this to be G.Fast and hence have included G.Fast in the geospatial analysis, we now understand it is more likely to be based on deploying VDSL2 technology at new remote nodes located between the PCP and the customer premises. This may have two opposing implications for costs. On the one hand, deploying G.Fast at multiple small nodes (as assumed in our geospatial analysis) is likely to be more costly than deploying a single, larger cabinet with VDSL2 technology under an FTTRN approach. On the other hand, the FTTRN approach may be unable to serve some premises that G.Fast would be able to reach, meaning that we have modelled the costs for G.Fast where FTTP may be more likely to be used. Whilst G.Fast costs are a relatively small component of the total costs, we plan to investigate the impacts of using this alternative approach for the final statement.[35]

[33] March 2017 WLA Consultation, Volume 1, paragraph 6.26

[34] In the geospatial analysis, we have included the costs of replacing customer modems in the LR-VDSL costs as this is a cost of using the technology. We discuss how we have approached these costs in assessing the costs to be recovered in section 5.

[35] As for LR-VDSL, we have examined the impact of including and excluding G.Fast from the geospatial analysis.

Question 4.1: Do you agree with our approach to assessing the technologies and technology mix that should be used as the basis for calculating the costs of BT's proposed rollout? Please provide reasons and evidence in support of your views.

5. Approach to cost modelling

Introduction

5.1 In this section we set out our proposed approach to modelling the costs of BT's proposed network expansion based on the technology mix resulting from the approach set out in Section 4. We then go on to explain how we propose to implement this approach and verify the outputs of our cost modelling.

5.2 To model the costs of BT's proposed network expansion we propose to:

- estimate the long-run incremental costs (LRIC) to BT of deploying and operating its proposed network expansion, excluding any common cost allocation from the wider WLA market;
- use a bottom-up approach to model these costs, using BT's existing copper and fibre network as the starting point (the so called 'scorched node' approach);
- exclude wireless costs associated with the network deployment;
- deduct any incremental revenues that Openreach may derive from the expanded network, over and above those already projected in the WLA charge control, from the modelled network costs; hence our model identifies the net costs of the copper and fibre network enhancements necessary to deliver the proposed network expansion;
- use CCA depreciation as the method for determining how the modelled costs will be recovered over time; and
- consistent with recovering costs across all broadband lines, we use the Openreach copper access Weighted Average Cost of Capital ('WACC') to determine the return on capital employed on the network.

5.3 We are publishing the model spreadsheets, in non-confidential versions, that we have used to produce our proposals (in what follows we refer to this model as the network expansion model).[36] Note that as a consequence of the redactions, the final outputs from the model spreadsheets are not consistent with the results shown in Section 7 and the Annexes.

Our conceptual approach to cost modelling

5.4 When determining the costs to include in a charge control, our usual approach is to allow the expectation of the recovery of efficiently incurred costs relating to both the costs we include and the way those costs are recovered across services and over time. Due to the long lived nature of some of the assets included in the network expansion, it is likely that some of their costs will be recovered in future charge controls. Although we will only be able to determine our precise approach to future charge controls at the time of setting them, we anticipate that we would treat the costs incurred in this particular network

[36] https://www.ofcom.org.uk/__data/assets/excel_doc/0021/105681/Volumes.xlsm
https://www.ofcom.org.uk/__data/assets/excel_doc/0020/105680/Network-Costs.xlsx
https://www.ofcom.org.uk/__data/assets/excel_doc/0028/105679/Cost-Recovery-Model.xlsm

expansion consistently with the approach we use in the next charge control relating to BT's costs in general, and consistent with our principle of allowing the expectation of the recovery of efficiently incurred costs.

Cost standard

5.5 To determine the costs of BT's proposed network expansion we need to establish what costs ought to be recovered, whether they are long-run incremental costs (LRIC), long-run incremental costs plus a mark-up for common costs (LRIC+), fully allocated costs (FAC) [37], or some other cost measure.

5.6 In choosing the appropriate cost standard, we are interested in allowing BT the opportunity to recover its efficiently incurred costs. We are also interested in minimising any distortions on the relative prices and competition in the WLA market, as will be further discussed in Section 6.

5.7 The proposed network deployment will expand the coverage and enhance the quality of broadband services in the UK, potentially leading to higher superfast broadband (SFBB) volumes. Consequently, we would expect that, in aggregate, SFBB services would attract more common costs as a result of the proposed rollout. This could be implemented through the use of a LRIC+ standard which reallocates common costs from WLA copper and fibre services to the proposed network deployment.

5.8 However, given that we are proposing to allocate the costs of network expansion across all broadband lines, any common cost reallocation to network expansion would find its way back to WLA copper and fibre services in the form of a cost surcharge. Importantly, any common cost reallocation could potentially distort the price relativities between copper and fibre services as determined in the March 2017 WLA consultation (see Annex 12). In our view such an outcome would be undesirable, as explained further in Section 6.

5.9 Therefore, in modelling the costs of BT's proposed rollout we propose to use a LRIC standard by which no mark up for common cost recovery would be added. This means that any common costs shared between this rollout and BT's existing fibre and copper networks (which are not directly caused by this rollout) would fall outside the scope of this cost modelling exercise.

Bottom-up modelling

5.10 When determining the costs of a service we generally opt between using a top-down approach or a bottom-up approach.

[37] FAC is an accounting concept designed to ensure that all of a firm's relevant costs (both incremental and common) are attributed to its activities. As FAC involves allocating all the firm's common costs across all products, the costs for individual products would normally be above the LRIC and could approximate LRIC+ depending upon a number of factors including the size of the output increment being considered. Where the relevant increment of output is the entire output of the firm, then the entire firm's costs are incremental, including costs that may be common to groups of individual services, in which case the LRIC / LRIC+ / FAC measures would all converge.

5.11 A top-down approach uses total network cost data and allocates these costs down to services based on service usage factors.

5.12 A bottom-up approach[38] estimates how much network equipment is needed to meet the expected level of output based on technical assumptions in relation to network capacity and dimensioning algorithms. It then calculates the total cost of this network equipment using evidence of the capital and operating costs of each piece of equipment.

5.13 As mentioned above, we are seeking to model the costs of a network that is capable of delivering the service specification in BT's proposal to all UK households. This is a network that has not been deployed yet and, as such, no network cost data exists today that would allow us to analyse these costs on a top-down basis.

5.14 In Section 4 we explained that we have engaged Cartesian to carry out a detailed geospatial analysis of the premises that currently have no access to a 10/1 Mbit/s broadband service and to configure a network that would fill such a service gap. We believe that it is appropriate to use the outputs of this analysis and assess the costs of the proposed deployment on a bottom-up basis. This is also consistent with the approach we have taken to model the costs of a fibre network capable of offering SFBB services in the March 2017 WLA consultation.

Scorched-node approach

5.15 In Section 2 we described the proposal by BT to the Government to expand its network coverage. We believe that in order to deliver this, BT is likely to reuse its existing copper and fibre networks and expand them as appropriate.

5.16 It is therefore reasonable to use BT's existing infrastructure as the starting point of our modelling exercise (the so called scorched node approach). This is also consistent with our modelling approach in the WLA bottom-up model.[39]

LR-VDSL migration costs

5.17 As explained in Section 4, one of the candidate technologies is LR-VDSL. A drawback of this technology is that it is incompatible with broadband services provided from the exchange, using MPF and SMPF. Consequently, customers using MPF and SMPF-based services that pass through a street cabinet hosting LR-VDSL services will need to be migrated to a VDSL-based service. This means that migration costs will need to be incurred if BT elects to deploy LR-VDSL.

[38] Our usual approach to bottom-up modelling involves us calibrating the outputs of any model against top-down data. We discuss our approach to model calibration in paragraphs 5.62 – 5.66

[39] See March 2017 WLA Consultation, Annex 12.

5.18 BT has recently published a consultation document on LR-VDSL in which it states that it is considering funding part of these migration costs, including the self-installation of the new VDSL service as well as a contribution towards new customer equipment if necessary.[40]

5.19 In determining the costs for delivering the proposed service we intend to capture any migration costs resulting from the implementation of LR-VDSL, excluding customer modem costs. Customer modem costs are likely to depend on the extent to which telecoms providers choose to use their own devices (as opposed to Openreach's) as they currently do when delivering SFBB services to their customers. If telecoms providers do choose to use their own equipment, including customer modem costs in the Wholesale Local Access Charge Control ('WLACC') would imply compensating BT for a service that it will not provide. We consider that the recovery of these costs could be better dealt with through separate commercial arrangements between Openreach and telecoms providers as suggested in Openreach's LR-VDSL consultation.

Exclusion of wireless costs

5.20 Wireless technologies such as FWA and Satellite could be the most cost effective solution for delivering the proposed service in some sparsely populated areas. As explained in Section 4, we will consider these technologies when determining the optimal mix of technologies for delivering the specified service; otherwise we would risk configuring a less efficient and costlier network, and thus having higher prices in the market to the detriment of consumers.

5.21 In the event that BT chooses to use wireless technologies to deliver the proposed service, we note that BT is not currently subject to wholesale access obligations that would force it to provide access to telecom providers over these technologies. We also note that BT did not offer to provide such access as part of its proposal to Government. We believe it would be inappropriate to include costs in the WLACC which are associated with assets over which BT does not provide wholesale access. Consequently, in costing the configured network we propose to exclude FWA and Satellite costs.

5.22 We believe that excluding wireless costs from the WLACC would not deny BT the opportunity to recover these costs. This is because, under its proposal, we expect BT would recover costs for FWA through its retail charges (and that customers using satellite services would purchase retail services at the same prices as those set by retail satellite providers currently). This is in contrast to services provided over copper or fibre, in which case BT proposes to maintain national pricing for services provided over this network rollout and so will not set prices higher than elsewhere in the UK.

[40] Openreach, May 2017, "LR-VDSL GEA-FTTC Delivering faster broadband to more customers", Industry consultation, page 5, http://www.fcs.org.uk/image_upload/files/CustomerConsultationLongReachVDSL.pdf

Rollout timeframes

5.23 In order to model the costs of BT's proposal we also need to make assumptions as to the timings of the network rollout, such as the start year of deployment and the years over which the network will be deployed.

5.24 In its proposal, BT offered to complete the rollout of the network by December 2021 or December 2022, depending on the technologies used. For these rollout targets to be met, BT would need to start deploying the network by 2018/19. Therefore, we propose to model the costs of the network using 2018/19 as the start year of deployment.

5.25 In addition, the proposed rollout targets mean that BT would have to deploy the network over a four or five year period depending on the mix of technologies used. In our base case we assume that BT does not use LR-VDSL and so it may be that the rollout would take longer. However, we propose to assume a 4-year rollout period. We have tested the sensitivity of our model outputs to this assumption in Annex 8.

Assessment duration

5.26 Our 2017 WLA proposals cover the three-year period from 2018/19 to 2020/21. These proposals were informed by both a top-down and bottom-up model. The top-down model forecasts costs out to the end of the charge control period, whilst the bottom-up model forecasts out to 2028/29.

5.27 We believe there are merits of using a similar modelling period as the WLA bottom-up model when we model the costs of BT's proposed network expansion. While aligning the assessment duration between the two models, extending the study period to 2028/29 would provide further transparency to all stakeholders as to the impact of our proposed approach on future WLA prices should these costs be included in future price reviews. It would also enable a more robust validation of the model assumptions given that it would allow us to test whether the model produces realistic outputs beyond the charge control period. We therefore propose to forecast costs out to 2028/29.

Indirect benefits

5.28 As well as driving costs, the proposed network expansion may produce benefits for BT. For example, standard broadband (SBB) customers may choose to take-up SFBB once new network technologies are rolled out in that area. Also, existing SBB and SFBB customers may trade-up to UFBB services in areas where BT chooses to deploy FTTP or G.Fast. In these instances, BT would enjoy additional wholesale revenue which otherwise would have not materialised in the absence of its proposed commitment.

5.29 The proposed network rollout could also produce indirect costs to BT if consumers were to stop trading up to higher speed services as a result of access to the proposed network rollout enhancing the speeds of existing services (i.e. service cannibalisation). For example, if a customer currently receiving less than 10 Mbit/s is considering migrating to a superfast broadband service (or would consider it during the period to 2020/21) but is uplifted to a

service offering 10 Mbit/s or more through the rollout of, and migration to, LR-VDSL, the customer may delay migrating to SFBB services, or may not migrate at all.

5.30 We believe that where incremental net benefits (costs) arise because of the proposed deployment it would be appropriate to factor them in our assessment of the costs of the deployment – ignoring them would lead to over or under recovery for BT's proposed network deployment.

5.31 Our approach for estimating these indirect benefits (costs) is set out in Annex 7. There, we identify higher GEA revenue for BT from the proposed network deployment. This is based on incremental GEA volumes over and above those projected in the March 2017 WLA model due to faster broadband speeds and/or extended SFBB coverage. We estimate the value of these incremental wholesale revenues to be in the region of £1m-£4m per year over the charge control period.

5.32 We propose to deduct these incremental wholesale revenues from the total CCA costs modelled over the study period, thus effectively allowing BT the recovery of the net costs of delivering the proposed network rollout.

5.33 Note that we have not included any indirect benefits that BT may derive at the retail level. The proposed network expansion will enable wholesale access to any telecom provider interested in providing the relevant services, so any benefits enjoyed at the retail level would be shared amongst telecom providers using the network (and would hence not be exclusive to BT). Estimating these benefits would require making a wide range of assumptions about retail pricing, margins and market shares. We are concerned that if we were to do so we could disproportionately increase the risk of regulatory failure and fail to provide BT with the opportunity to recover efficiently incurred costs. Therefore, we have not sought to estimate and take account of potential indirect retail gains (costs) from our assessment of the costs of the proposed network rollout.

Depreciation method

5.34 Once we have estimated the total costs of network expansion, we need to determine how these costs will be recovered over time. Our preferred approaches to depreciation are economic depreciation (ED) or Current Cost Accounting (CCA) depreciation.

- **ED** matches the cost of equipment to its actual and forecast use over the long term. Consequently, there is relatively little depreciation in years when utilisation is low and relatively high depreciation in years of full, or almost full, equipment utilisation.
- **CCA depreciation** is calculated for each asset as the gross replacement cost of that asset divided by its lifetime. This is similar to straight line depreciation, albeit adjusted by changes in asset prices, meaning that depreciation is not deferred from years when utilisation is lower to those when it is higher, as under an ED approach.

5.35 We believe that CCA depreciation is a more appropriate approach in this case. As explained in Section 6, we are proposing to recover network expansion costs from all Openreach broadband lines. As such, the problem of low network utilisation in the early years of

rollout will not be present here and, as a result, we expect CCA depreciation to produce similar results as ED, and it has the advantage of being a simpler method.

5.36 In addition, given that we are applying CCA depreciation to inform our March 2017 WLA proposals[41], using CCA depreciation for establishing the costs of the proposed network deployment will ensure a consistent approach across the whole review. Therefore, since CCA depreciation is likely to be a good proxy of ED in this case, we do not see any justification for deviating from the approach we are using elsewhere in the WLA review.

WACC

5.37 To determine which WACC to apply in the case of cost recovery for the proposed network deployment, we have assessed whether the systematic risk following the proposed approach to cost recovery would be more akin to that in the provision of access lines in general (for which we estimated the Openreach access line WACC at 8.0% pre-tax nominal in the March 2017 WLA Consultation) or the systematic risk associated with telecoms usage services in general (i.e. the Other UK telecoms WACC estimated at 9.4% pre-tax nominal). Our assessment considers the following factors: systematic demand risk, capital leverage and long term pay-offs.[42]

Systematic demand risk

5.38 Systematic demand risk is a measure of the sensitivity of demand to changes in income. The systematic demand risk affects the revenue from the services from which the relevant costs are being recovered.

5.39 As set out in Section 6 below, we are proposing to allow BT to recover the costs of its proposed network deployment across all Openreach broadband lines, regardless of whether they are copper or fibre based. We consider that this reduces the demand-side risk associated with the funding of the net investments in this proposed rollout because we consider the demand for access lines capable of supporting broadband is relatively stable, even if the broadband service delivered over that line can vary.

5.40 Using the Openreach network, broadband can be delivered in several ways depending on the wholesale access service purchased; for example, using MPF (on its own), WLR + SMPF, WLR + GEA, MPF + GEA and FTTP. We expect that most broadband lines will be delivered using a copper access line (either MPF or WLR). Where this is the case, while the

[41] In our March 2017 WLA consultation we proposed to use CCA depreciation to determine the cost recovery path for fibre access costs. We said that CCA depreciation was a reasonable proxy for ED given that we expect fibre volumes to become more stable by the end of the charge control. In addition we said that, compared to ED, CCA depreciation is less vulnerable to uncertainty around volume and cost forecasts as it looks at a much shorter time horizon relative to ED. We argued that this was an important feature in this charge control given the high level of uncertainty around our service volume forecasts due to the potential impact of our DPA policy and of competitive network investments. Finally, we stressed the importance of keeping a consistent cost recovery approach across copper and fibre services, so that common costs shared between these two services can be analysed in a coherent way.
https://www.ofcom.org.uk/__data/assets/pdf_file/0034/99637/Vol2-Charge-control.pdf.

[42] We considered these factors in the March 2017 WLA Consultation when considering the systematic risks of NGA services. See paragraphs A16.142 to A16.164 of that document.

broadband products provided alongside the copper products could change (e.g. moving from an SMPF to a GEA product in the case of WLR or from MPF only to MPF+GEA in the case of MPF), a copper access line is always required, indicating that the systematic demand risk for network expansion cost recovery is linked to the systematic demand risk for copper access products. That is, in these cases, a copper access line is required regardless of which additional 'broadband' product it is combined with. While we also propose to recover costs from broadband delivered over fibre-only (i.e. FTTP services), only a small proportion of total Openreach broadband lines are expected to be delivered using FTTP in the control period. Moreover, where the same cost per line is being recovered regardless of whether the line is copper or fibre, any loss (or gain) beyond the central forecast of FTTP does not represent a loss of revenue to fund the proposed network rollout unless the customer abandoned broadband entirely.

Capital leverage

5.41 Capital leverage refers to the relative proportion of fixed costs within the total costs of a project. Higher capital leverage (i.e. relatively higher fixed costs) will tend to increase the systematic risk since the volatility of returns are magnified. BT's proposal indicates that the investment in the proposed network rollout will mostly occur before 2021, implying that the project could have relatively high capital leverage initially, although we are not convinced that this is particularly high compared to other telecoms investment programmes. Even if the investments were above average in scale, the capex is low compared to the overall opex and capex associated with the base of lines from which it is proposed to be recovered – making it more comparable to a typical network upgrade programme.

Long term pay-offs

5.42 In terms of pay-off periods, investments with payoffs extending far into the future are likely to face higher systematic risk. This means the systematic risk associated with investment in new services with unproven demand is likely to be higher than for the same scale of investment associated with a mature service. We are not aware of any evidence that this investment would have a particularly long pay-off period. In particular, we propose allowing BT to recover its efficiently incurred costs from all Openreach broadband customers starting form the first year of the new controls (i.e. from April 2018), which is fundamentally different to the risk associated with investment in completely new services when revenue is contingent on future take-up (and not revenue from existing services with proven demand).

Provisional conclusion

5.43 Taking account of systematic demand risks, capital leverage and long term pay-offs, we consider that the model of cost recovery proposed for BT's proposed rollout of a network to provide universal broadband is more consistent with the Openreach access line WACC (which was estimated at 8.0% proposed in the March 2017 WLA Consultation) rather than that of Other UK telecoms (estimated at 9.4% in the March 2017 WLA Consultation). We

therefore propose to apply the Openreach WACC to the estimated capital employed of the proposed network deployment for the purposes of establishing the cost recovered from each Openreach access line used to support broadband.

5.44 Our use of the Openreach access line WACC estimated at 8.0% pre-tax nominal in this consultation is without prejudice to our consideration of representations we have received from respondents to the March 2017 WLA Consultation. To identify the impact of potential variation in the parameters making up the WACC, we have performed sensitivities based on a WACC 1% point higher and lower than 8.0%.

Implementation of our modelling approach

5.45 In Section 2 we provided a high-level overview of the structure we are proposing to use for our bottom-up model (see paragraphs 2.6 -2.7).

5.46 More specifically, the model performs the following six key calculations:

- Step 1: Takes the qualifying premises as per the 2016 Connected Nations data and dimensions a network to deliver the specified service based on the geo-locations of these premises.
- Step 2: Calculates the incremental GEA volumes associated with the deployment of the dimensioned network in order to produce estimates of service take-up and incremental revenue (discussed in Annex 6).
- Step 3: Calculates the costs of the dimensioned network over time based on the assumed network coverage, technology mix and service take-up.
- Step 4: Spreads the costs of the network assets over time by applying CCA depreciation based on the assumed asset life.
- Step 5: Applies top-down adjustments to the CCA costs and incremental revenue to account for future network rollout that is not part of BT's commitment.
- Step 6: Calculates the net costs of the network expansion and recovers these costs from all Openreach broadband lines (see Section 6).

5.47 These calculations are currently set up for our base case which assumes the optimistic network expansion specification scenario described in section 3 and which includes around 2.4m qualifying premises. Our base case also assumes no use of LR-VDSL on the basis that the technology is still under trial and, as a result, the level of performance it may achieve is yet unclear. Further details on the set of assumptions comprising our base case are provided in Annex 8.

5.48 Details of the implementation of steps 1 and 3 above are provided in the Cartesian Report at Annex 10. Below we provide a more detailed discussion around specific cost inputs to the model not covered in the Cartesian Report and the top-down adjustments we have applied to account for future network build.

Cost inputs

Operation Support Systems/Business Support Systems costs

5.49 BT informed us that a systems upgrade would be required in the event they use LR-VDSL. BT estimates such upgrade would cost around £10m.[43] We have included these costs in the Network Cost module and have spread them over two years as per BT's submissions. Consistent with the WLA bottom-up model, we have assumed a 10-year asset life for these software investments.

Repair costs

5.50 In the WLA bottom-up model we included costs from extra faults in the copper network due to the delivery of SFBB services. There, we argued that SFBB customers tend to originate more faults than SBB customers given their more intense use of the copper line (i.e. higher bandwidth usage).[44] Consistent with this, we have included these costs in the model.

5.51 We have only applied these costs to broadband customers using copper-based technologies, e.g. FTTC, LR-VDSL and G.fast, as we do not expect these additional costs to arise with FTTP customers which do not use BT's copper loops for their broadband service.

5.52 To inform the number of extra faults that would be driven by copper-based broadband customers we have looked at the number of extra faults per SFBB line forecasted in the WLA bottom-up model and have taken the average over the modelling period. This suggests a fault rate of 0.015 faults per subscriber, per year, which we have included in the Network Cost module.[45]

Service Level Guarantee (SLG) Payments

5.53 In the WLA bottom-up model we also included SLG related costs.[46] We expect these costs to arise within the footprint of the proposed network deployment as well. Consistent with our WLA cost modelling, we identify two drivers of SLG payments: rentals and connections. The Network Cost module of the network expansion model includes two SLG cost components to capture these cost drivers.

5.54 We have based the value of these cost drivers on the quality of service analysis underpinning the assumptions of our WLA bottom-up model. Namely we have taken the SLG payment by year, per rental and per connection, implied in our WLA modelling work, and have averaged it over the study period of the network expansion model. These result in yearly costs of £0.44 per rental and £3.64 per connection.

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[43] BT response to Ofcom Formal Information Request provided by BT on 4 August 2017.
[44] Annex 12, paragraphs A12.144, and A12.183 to A12.184.
[45] The model outputs suggest the costs associated with this extra fault rate are small as only account for less than 1% of the estimated additional network expansion charge.
[46] Annex 12, Paragraphs A12.187 to A2.189.

Top-down adjustments

5.55 In Section 3 we said that our geospatial analysis of qualifying premises was based on our Connected Nations 2016 report. We explained that adjustments had to be made to account for premises that will be reached by future network rollouts such as Project Lightning and BDUK. Based on BDUK coverage targets, we estimated that 785,000 premises will not have access to 10 Mbit/s and would therefore be qualifying premises by March 2021 (see paragraphs 3.11 to 3.13). This means that we would have to remove around 1.6m premises from our base case scenario (2.37m premises) in order to match this premises forecast.

Our approach

5.56 To implement this adjustment one option would be to remove the premises directly from our geospatial analysis. This however presents us with the issue of having to determine which premises to remove, which, in the absence of location data for these 1.6m premises, would be rather arbitrary and could significantly distort the outputs of the geospatial analysis, and hence the results of our cost modelling.

5.57 Instead we propose to apply a top-down adjustment to our modelled CCA costs and incremental GEA revenue as set out below.

Implementation of our approach

5.58 To work out the magnitude of the top-down adjustment we have considered that the 785,000 qualifying premises are likely to be harder to reach than the average premises in the modelled network expansion rollout. To account for this we have assumed that the premises to remove would largely have been covered using cabinet-based technologies such as VDSL and LR-VDSL, which are typically less expensive than G.fast and FTTP.

5.59 On this basis, we have reduced our modelled FTTC costs in the same proportion as the reduction in the number of FTTC premises that would be necessary to remove the 1.6m premises.

5.60 Where the number of premises to be removed is greater than the number of premises served by FTTC, we have taken the view that a complete removal of FTTC would be unrealistic. We have therefore removed all but a small proportion of FTTC lines and then removed the remainder from G.Fast premises, and then from FTTP premises (if necessary to get to the 1.6m number), by removing costs for these technologies in the same proportion as the reduction in premises. This occurs in our model in the case where there is no use of LR-VDSL, which we take as our base case. We explain the calculation in more detail in Annex 8.

5.61 For adjusting our modelled incremental GEA revenue we have applied a similar logic. However, given that we have assumed that the incremental revenue per subscriber is the same irrespective of the technology used, we have applied the adjustment directly on the total incremental GEA revenue forecast, as opposed to by technology.

5.62 We have implemented these adjustments in the Cost Recovery module, after calculating total CCA costs, in the 'Adjustments' worksheet.[47]

Approach to cost verification

5.63 We consider that it is desirable to check the reasonableness of the outputs of our model. When we have built other bottom-up models in the past we have calibrated the outputs against real-world data wherever possible. In the WLA bottom-up model we compared our model outputs against a range of BT sources, including top-down costs and outputs from the BT Chief Engineer's Model.

5.64 For the proposed network deployment there are no actual costs to compare the model outputs against. However, previous estimates of the costs of the proposed deployment could be used as cross-checks. These previous estimates include those from our advice to the government on a potential broadband USO and estimates supplied by BT as part of its proposed network deployment. Annex 8 compares these cost estimates against our model outputs.

5.65 As part of these cross-checks we have identified a number of issues relating the assumptions in our cost model. These include:

- our geospatial analysis not taking account of a low use of LR-VDSL which BT considers likely in the case where it uses this technology;
- BT facing higher unit costs in harder to reach areas, where qualifying premises are more likely to be located; and
- more use of fixed network technologies relative to FWA than predicted by our geospatial analysis.[48]

5.66 To address these issues we have made a number of adjustments to our model which we believe enable it to produce more realistic outputs. These adjustments are described in greater detail in Annex 8. We have:

- applied an uplift to the number of premises served by fixed technologies to account for less use of FWA than predicted by the model. We have assumed all these premises would be served by FTTP, on the basis that these premises are likely to be relatively dispersed and so cabinet based technologies (and G.Fast) would be less likely to be technically or commercially viable; and
- increased the unit costs assumed for a number of network components (including duct and pole, fibre and planning) to account for higher costs in remote areas, compared to the rest of the UK.

5.67 For the Statement, we will seek to refine these adjustments and, wherever possible, will adjust the parameters we assume in our geospatial analysis. To do so we plan to engage

[47] https://www.ofcom.org.uk/__data/assets/excel_doc/0021/105681/Volumes.xlsm
https://www.ofcom.org.uk/__data/assets/excel_doc/0020/105680/Network-Costs.xlsx
https://www.ofcom.org.uk/__data/assets/excel_doc/0028/105679/Cost-Recovery-Model.xlsm

[48] Based on BT's proposal, for the purposes of our cost modelling, we expect that no more than 1% of premises would be served by fixed wireless and satellite technologies.

with BT to understand the results of the latest trials of LR-VDSL and update our analysis based on the Connected Nations 2017 report. We believe this update will mitigate the need for top-down adjustments and thus will enhance the robustness of our model results, since the impact of recent network rollout would be directly captured in our geospatial analysis.

Question 5.1: Do you agree with our proposed approach to modelling the costs of BT's proposed network expansion? Please provide reasoning for your answer.

6. Approach to cost recovery

Introduction

6.1 In section 5 we set out how we have estimated efficient costs of delivering the proposed network expansion. In this section, we set out our proposals to allow recovery of costs associated with providing this deployment, in the price of services covered in the WLA Charge Controls. We set out the services over which we propose to recover the costs of the additional investment and how we would implement such an approach in the WLA Charge Controls.

Summary of proposals

6.2 We consider how to recover the costs associated with delivering the additional network investment. These costs will:

- Include the long run incremental costs associated with the costs of the network expansion;
- Be net of any indirect benefits to Openreach from higher superfast broadband take-up (as discussed in section 5);
- Exclude the costs likely to be incurred from deploying wireless technologies such as FWA or Satellite, (as discussed in section 5).

6.3 We propose recovering the costs over all broadband lines using the same mark-up on each broadband line. We believe this approach appropriately balances minimising distortions to 'allocative efficiency' and limiting the distortion to competition between copper and fibre. We set out our reasons in more detail in the next sub-section.

How should we allow the cost of the network expansion to be recovered?

Recovering the cost of the network expansion through the WLA Charge Controls

6.4 In meeting its proposed network expansion, BT will incur costs to expand its fibre access network footprint, and will provide customers the opportunity to purchase superfast broadband services. As with any network expansion, we would look to allow efficiently incurred costs in the charge control for services associated with that network expansion. Where we are setting a single national wholesale price, we would then look to include the cost of the network expansion in the aggregate cost of providing the service. We therefore believe that, in principle, the costs of expanding BT's fibre access network to deliver its universal broadband proposal could be included in services covered by the WLA Charge Controls.

6.5 Some of the broadband services provided as part of BT's commitments may not have the same characteristics as any other current services. In our March 2017 WLA consultation we proposed that, were it to deploy LR-VDSL that required customers with a broadband service supported by LLU services to migrate to an alternative service, BT must offer telecoms providers a suitable replacement service at no additional charge.[49] In such a case the alternative service is likely to be provided using an FTTC technology but which has characteristics more like those of services provided via copper (i.e. slower speeds than can be offered over standard FTTC products) at the MPF price. Due to the mix of services with standard and superfast broadband characteristics being provided over this technology, it is not immediately obvious which service or set of services the cost should be added to.

6.6 In our modelled base case, we have assumed that LR-VDSL has not been used as part of the network expansion. Therefore, in our modelled base case the network expansion looks more like the current network deployment (i.e. a mix of FTTC and FTTP) and so we could simply treat it as an expansion of the FTTC network and include the costs in our March 2017 WLA Charge Controls bottom-up model, meaning these costs would be recovered from GEA services. However, there is still a high degree of uncertainty around how the services under BT's commitment will be provided and their specific characteristics and so we have explored alternative options for cost recovery.

Assessing how to recover the cost of the network expansion

6.7 In determining how we recover the cost of the network expansion we need to decide which services we recover costs over and how we recover costs across those services.

6.8 We have considered three options for the services over which to recover costs:

- All lines: Recover across all Openreach lines;
- All superfast fibre lines: Recover over all Openreach fibre broadband lines i.e. Openreach broadband lines that have a fibre component and are provided with the offer of at least a superfast broadband service; or
- All broadband lines: Recover over all Openreach broadband lines.

6.9 When recovering costs across different services, we must also consider how costs are allocated to these services. We have considered two options for allocating costs to services:

- A constant percentage mark-up over cost, i.e equi-proportionate mark-up (EPMU); or
- A constant mark-up in pounds per line, which we refer to as constant mark-up.

6.10 To assess the best way to recover the cost of the network expansion, we have applied our six principles of pricing and cost recovery. These principles are a framework to allow us to

[49] See paragraph 6.26.

assess options against our objectives of promoting efficiency, promoting sustainable competition and acting in a way that benefits consumers.[50]

6.11 Our six principles of cost recovery are:

a) Effective competition - the mechanism for cost recovery should not undermine or weaken the pressures for effective competition.

b) Cost causation - costs should be recovered from those whose actions cause the costs to be incurred at the margin.

c) Cost minimisation - the mechanism for cost recovery should ensure that there are strong incentives to minimise costs.

d) Distribution of benefits - costs should be recovered from the beneficiaries especially where there are externalities.

e) Practicability - the mechanism for cost recovery needs to be practicable and relatively easy to implement.

f) Reciprocity - where services are provided reciprocally, charges should also be reciprocal.

6.12 When using these principles to assess our options we have not given any weight to cost minimisation, practicability or reciprocity. Our use of a CPI-X charge control provides Openreach with incentives to minimise costs and therefore it is not a relevant consideration for the options we are considering. Reciprocity is not relevant in this case and therefore we do not discuss it further. We anticipate that all of these options would have a similar level of complexity in their implementation and so we do not think there would be a significant difference in terms of practicability.[51]

Assessment of options

6.13 In the March 2017 WLA consultation, we gave particular weight to effective competition, and, in particular, incentivising competitive investment principles when considering how to allocate costs.[52] We proposed an allocation based on our view of the most appropriate pricing differential between MPF and GEA prices and between the prices of different speed of GEA services.[53] We would not want the allocation of the costs associated with network expansion to distort the absolute pricing differential we set out in the March 2017 WLA consultation and so have sought to allocate costs to minimise this distortion.

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[50] We have previously used these six principles to inform cost recovery decisions. For example, see Section 6 of "Porting charges under General Condition 18", September 2014 https://www.ofcom.org.uk/__data/assets/pdf_file/0026/79424/statement_on_porting_charges_under_gc18.pdf

[51] As discussed in Section 6.23-6.28 using the all broadband lines options does require some changes to the way services are offered, but we believe these changes are minor.

[52] See March 2017 WLA consultation, Volume 2, Section 2.4-2.49.

[53] In the 2017 WLA consultation we allocate common costs between copper and GEA services using an EPMU approach and between different variants of GEA using a bandwidth gradient approach.

6.14 Using the all fibre lines option would not allow us to minimise this distortion because it would increase the price of GEA services whilst keeping the price of copper broadband services unchanged.[54] [55] Likewise, using an EPMU approach with any of our service options would change the absolute price differential between copper and GEA broadband services. We therefore have a preference for either allocating over all lines or all broadband lines and using a constant mark-up per line approach. These options will allow us to maintain the pricing differential set out in the March 2017 WLA consultation.

6.15 Neither the allocation of costs to all lines nor the allocation of costs to all broadband lines is consistent with cost causation as these costs are caused by the additional network deployment. An efficient way of recovering the costs is to allocate them to the services which are least sensitive to price, minimising distortions to allocative efficiency. Both the all lines and all broadband lines options are likely to have similar sensitivities to changes in price. Historically, we may have considered the broadband service to be more price sensitive than the fixed access line, but consumers increasingly purchase a fixed line in order to have access to broadband, and regard broadband as a necessity suggesting that consumers' price sensitivity is decreasing for these services.

6.16 Recovery of costs over as broad a base as possible minimises the mark-up any single consumer faces and therefore minimises the distortion to allocative efficiency. Recovery over all lines minimises the mark-up any single consumer faces and will therefore minimise the distortion to allocative efficiency suggesting the all lines option is marginally preferable.[56]

6.17 Although the cost causation principle points more towards recovery over all lines, the distribution of benefits principle points more towards recovery over all broadband lines. The distribution of benefits principle argues that costs should be recovered from those that benefit, especially where there are externalities. Some may benefit directly from the network expansion, i.e. those in areas where the network would be upgraded to provide the speeds consistent with BT's commitment. Some third parties may also indirectly benefit.

6.18 Indirect benefits such as greater social inclusion and greater access to learning opportunities are potential positive externalities that would benefit the whole of society. This would imply recovering the costs from as wide a base as possible and so all lines would be favoured over all broadband lines.

6.19 As set out in section 5, roll-out of LR-VSDL would require copper to fibre migration in cabinets where it is implemented with a safeguard product being provided to the purchasing telecoms provider at a price to ensure it is no worse off than when using

[54] We may allow this differential to change if we considered that the services provided as part of the network expansion were part of the GEA increment and therefore should be included in the GEA incremental costs.
[55] The difference in mark-up between using all superfast fibre lines or all broadband lines in 2020/21 using our Base Case is £0.08 per line per month.
[56] The difference in mark-up between using all line or all broadband lines in 2020/21 using our Base Case is £0.02 per line per month.

copper. These customers may benefit if the service is better, for example through higher speeds or greater stability. Existing fibre customers may also see an improvement in their service with the introduction of LR-VDSL.[57] This benefit will only occur if LR-VDSL is used, which we assume is not the case in our base case. If LR-VDSL is used then we estimate that this may benefit around 100,000 customers.

6.20 Implementation of the network expansion may also encourage further take-up of superfast broadband. Standard broadband customers, that already receive a service in excess of the minimum service required by the agreement between Government and BT, may choose to take-up superfast broadband once the network has been expanded. Also, existing superfast broadband customers may trade-up to ultrafast broadband services, for example, in areas where Openreach expands its network by deploying FTTP.

6.21 These indirect effects would benefit some broadband customers, but not voice-only customers, meaning the distribution of benefits favours us using the all broadband line option. We would also not wish to allocate the cost of a functionally different service (i.e. broadband) to voice only lines.

6.22 Overall because a significant number of broadband customers could benefit from the additional network deployment and the difference in the mark-up between the all lines option and all broadband lines option is small, our preference is to recover the net cost of the network expansion over all broadband lines. We therefore propose recovering the cost of the network expansion on the basis of a constant mark-up per broadband line.

Implementation of cost recovery over all broadband lines

Implementation of recovery through a mark-up on a constant per line basis

6.23 To recover the net costs through a constant mark-up per line we need to recover from the following services, based on the total Openreach broadband forecasted volumes:

- WLR plus SMPF;
- MPF;
- WLR plus GEA;
- MPF plus GEA; and
- GEA only.[58]

6.24 We propose to allocate costs proportionately to SMPF, MPF and GEA, including all product options, based on our volume forecasts set out in the March 2017 WLA consultation.[59]

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[57] In the March 2017 WLA consultation we said that where it uses LR-VDSL, Openreach should offer products so that no consumer is worse off as a result of the introduction of LR- VDSL, and this was reflected in Openreach's LR-VDSL consultation.

[58] GEA only currently refers to the provision of FTTP, but in the future we expect this to also include an FTTC service provided without WLR or MPF (so called single order GEA).

[59] See March 2017 WLA consultation, Annex 10.

6.25 In the March 2017 WLA consultation we proposed charge controls on MPF[60] and GEA 40/10.[61] If we added costs to each of these products, there would be a double allocation in the case where MPF is purchased with GEA, leading to over-recovery. To avoid this, we propose revising these charge controls. We could achieve this either by:

- Having two MPF prices – one that is paid when MPF is bought on its own, and a different, lower charge for when it is purchased with GEA; or
- Having two GEA 40/10 prices – one that is paid when GEA 40/10 is purchased with WLR or on its own, and a lower one when it is purchased with MPF.

6.26 We propose to take the second of these approaches and have separate controls for annual rental when GEA 40/10 is taken without MPF, i.e. with WLR or on its own, and when GEA 40/10 is taken with MPF.

6.27 We consider it better to take this option because if a customer upgrades from standard to superfast broadband it would be clear in all cases which GEA product should be selected at the time of purchase and so the mark-up associated with the provision of network expansion would only be incurred once. If we took the first approach and had different MPF prices, at the time of an upgrade the MPF product would need to be changed as well as adding the GEA product. We think this may be more complex and could lead to the mark-up being incurred twice.

6.28 In the next section we set out the impact that these proposals would have on the charge controls proposed in the March 2017 WLA consultation.

Question 6.1: Do you agree with our proposal to recover the costs over all broadband lines?

Question 6.2: Do you agree with our proposed approach to implementing recovery from all broadband lines?

[60] Service Maintenance Level 1.
[61] Up to 40 Mbit/s download and up to 10 Mbit/s upload.

7. Impact on WLA charge control proposals

7.1 In this section we present an overview of the results of the bottom-up model we have used to calculate the cost of network expansion and the impact on our WLA charge control proposals. Specifically, we outline:

- the forecasted additional cost per broadband line that would result from the modelled network expansion;
- how to reflect such additional cost in the prices of services from which we propose to recover these costs;
- whether to apply a glide path or a one-off adjustment; and
- the unit cost impact on our WLA charge control proposals.

7.2 More detailed information on the results of the network expansion bottom-up model, including sensitivity analysis, can be found in Annex 8 and in the models published alongside this consultation.[62]

Model results

7.3 Table 7.1 below sets out the proposed additional cost per broadband line to account for the additional costs of BT's proposed network expansion. Based on the proposals set out in this consultation document the allocation per broadband line will be £0.39 in 2018/19, £1.19 in 2019/20 and £1.93 in 2020/21 in our base case. This is equivalent to a monthly additional charge of around £0.03 in 2018/19, £0.10 in 2019/20 and £0.16 in 2020/21. Table 7.1 also presents the ranges over which we are consulting based on our scenario analysis.

Table 7.1: Proposals for additional charge

Range and (central estimate)	Proposals for annual charges (£ – nominal)		
	2018/19	2019/20	2020/21
Additional cost for network expansion	£0.23 to £1.57 (£0.39)	£0.71 to £3.80 (£1.19)	£1.14 to £5.89 (£1.93)

Impact on WLA CC proposals

Glide-path or one off adjustment

7.4 Glide-paths involve setting the control so that there is a gradual convergence of prices to a target level. We have previously explained that in setting charge controls we prefer glide

[62] https://www.ofcom.org.uk/__data/assets/excel_doc/0021/105681/Volumes.xlsm
https://www.ofcom.org.uk/__data/assets/excel_doc/0020/105680/Network-Costs.xlsx
https://www.ofcom.org.uk/__data/assets/excel_doc/0028/105679/Cost-Recovery-Model.xlsm

paths as opposed to one-off adjustments, particularly when resetting a charge control.[63] In this case, the alternative would be a yearly adjustment to broadband prices to reflect our estimate of the network expansion cost for that year (e.g. £0.39 in 2018/19).

7.5 When setting a charge control, glide-paths can help incentivise the regulated firm to make efficient investment by allowing it to keep the proceeds of outperforming the charge control for an extended period of time. In this case, we are considering inclusion of network expansion costs which will be incurred in the future. Therefore, the traditional type of investment incentives would not be encouraged with a glide-path for the network expansion costs.

7.6 We set out in Section 6, that in the March 2017 WLA consultation we considered carefully the relative prices of copper and fibre products, we did not consider that the recovery of the cost of network expansion to be the appropriate place to reconsider these differentials. Therefore, we wanted to ensure that the inclusion of these costs minimised any change to them. A one-off adjustment would preserve the differential, while any glide-path adjustments could change the differentials.

7.7 We also note that the difference between a glide-path approach or one off adjustment would be small, based on the proposed additional charges set out in table 7.1 above.

Revision to WLA CC proposals

7.8 Following consideration of stakeholder responses to our March 2017 WLA Consultation we plan to publish a further consultation document shortly addressing elements of the proposed charge controls. For the purposes of illustration we show here the impact on the central estimate of the charge control set out in our March proposals. Table 7.2 below shows the illustrative impact on our March proposals for the MPF rental charge control.

Table 7.2: LLU charge control proposals – MPF Rental

Central estimate	Annual charge with effect from 1 July 2017 (£)	Proposals for annual charges (£ – nominal)		
		2018/19	2019/20	2020/21
March 2017 proposals (central estimate)	£85.29	£83.50	£82.28	£81.98
Additional cost for network expansion		£0.39	1.19	1.93
Illustrative impact		£83.89	£83.47	£83.91

7.9 Table 7.3 below shows the illustrative impact on our March proposals for the GEA 40/10 rental charge control. The March 2017 proposals would still apply when GEA is taken with MPF.

[63] See March 2017 WLA Consultation, Vol 2, Section 2.9 onwards

Table 7.3: GEA charge control proposals - GEA 40/10 rental when taken without MPF

Central estimate	Current annual charge at 31 March 2017 (£)	Proposals for annual charges (£ – nominal)		
		2018/19	2019/20	2020/21
March 2017 proposals (central estimate)	£88.80	£66.28	£57.00	£52.77
Additional cost for network expansion		£0.39	1.19	1.93
Illustrative impact		£66.67	£58.19	£54.70

7.10 We explained in the March 2017 WLA Consultation (Volume 2, paragraphs 5.20-5.76) why we considered that our proposed charge control conditions satisfied the legal tests under the Communications Act 2003. We consider that such conditions, with the addition of the matters proposed in this document and as amended by the Notification at Annex 5, will continue to meet those legal tests for the reasons set out in the March 2017 WLA Consultation.

Regulatory reporting

7.11 In the March 2017 WLA consultation we proposed to impose regulatory reporting requirements on BT in relation to the WLA market.

7.12 We will consult shortly on what regulatory reporting requirements to impose on BT in relation to this network expansion. This consultation is likely to consider how BT should account for the costs of network expansion and how information on network expansion should be recorded and reported within BT's regulatory financial statements.