Business Connectivity Market Review – Annexes: Leased lines charge controls and dark fibre pricing

Redacted version ✂

Consultation

Publication date: 12 June 2015

Closing Date for Responses: 7 August 2015

Contents

Annex 1

Responding to this consultation

How to respond

A1.1 Ofcom invites written views and comments on the issues raised in this document, to be made **by 5pm on 7 August 2015**.

A1.2 Ofcom strongly prefers to receive responses using the online web form at http://stakeholders.ofcom.org.uk/consultations/llcc-dark-fibre/howtorespond/form, as this helps us to process the responses quickly and efficiently. We would also be grateful if you could assist us by completing a response cover sheet (see Annex 3), to indicate whether or not there are confidentiality issues. This response coversheet is incorporated into the online web form questionnaire.

A1.3 For larger consultation responses - particularly those with supporting charts, tables or other data - please email 2016LLCC@ofcom.org.uk attaching your response in Microsoft Word format, together with a consultation response coversheet.

A1.4 Responses may alternatively be posted or faxed to the address below, marked with the title of the consultation.

Kate Walters
Competition Group, 4th Floor
Riverside House
2A Southwark Bridge Road
London SE1 9HA

A1.5 Note that we do not need a hard copy in addition to an electronic version. Ofcom will acknowledge receipt of responses if they are submitted using the online web form but not otherwise.

A1.6 It would be helpful if your response could include direct answers to the questions asked in this document, which are listed together at Annex 4. It would also help if you can explain why you hold your views and how Ofcom's proposals would impact on you.

Further information

A1.7 If you want to discuss the issues and questions raised in this consultation, or need advice on the appropriate form of response, please contact Kate Walters, kate.walters@ofcom.org.uk (020 7783 4205) or Georgi Pojarliev, georgi.pojarliev@ofcom.org.uk (020 7981 3241).

Confidentiality

A1.8 We believe it is important for everyone interested in an issue to see the views expressed by consultation respondents. We will therefore usually publish all responses on our website, www.ofcom.org.uk, ideally on receipt. If you think your response should be kept confidential, can you please specify what part or whether all of your response should be kept confidential, and specify why. Please also place such parts in a separate annex.

A1.9 If someone asks us to keep part or all of a response confidential, we will treat this request seriously and will try to respect this. But sometimes we will need to publish all responses, including those that are marked as confidential, in order to meet legal obligations.

A1.10 Please also note that copyright and all other intellectual property in responses will be assumed to be licensed to Ofcom to use. Ofcom's approach on intellectual property rights is explained further on its website at http://www.ofcom.org.uk/terms-of-use/

Next steps

A1.11 Following the end of the consultation period, Ofcom intends to publish a statement in early 2006.

A1.12 Please note that you can register to receive free mail Updates alerting you to the publications of relevant Ofcom documents. For more details please see: http://www.ofcom.org.uk/email-updates/

Ofcom's consultation processes

A1.13 Ofcom seeks to ensure that responding to a consultation is easy as possible. For more information please see our consultation principles in Annex 2.

A1.14 If you have any comments or suggestions on how Ofcom conducts its consultations, please call our consultation helpdesk on 020 7981 3003 or e-mail us at consult@ofcom.org.uk . We would particularly welcome thoughts on how Ofcom could more effectively seek the views of those groups or individuals, such as small businesses or particular types of residential consumers, who are less likely to give their opinions through a formal consultation.

A1.15 If you would like to discuss these issues or Ofcom's consultation processes more generally you can alternatively contact Graham Howell, Secretary to the Corporation, who is Ofcom's consultation champion:

Graham Howell
Ofcom
Riverside House
2a Southwark Bridge Road
London SE1 9HA

Tel: 020 7981 3601

Email: Graham.Howell@ofcom.org.uk

Annex 2

Ofcom's consultation principles

A2.1 Ofcom has published the following seven principles that it will follow for each public written consultation:

Before the consultation

A2.2 Where possible, we will hold informal talks with people and organisations before announcing a big consultation to find out whether we are thinking in the right direction. If we do not have enough time to do this, we will hold an open meeting to explain our proposals shortly after announcing the consultation.

During the consultation

A2.3 We will be clear about who we are consulting, why, on what questions and for how long.

A2.4 We will make the consultation document as short and simple as possible with a summary of no more than two pages. We will try to make it as easy as possible to give us a written response. If the consultation is complicated, we may provide a shortened Plain English Guide for smaller organisations or individuals who would otherwise not be able to spare the time to share their views.

A2.5 We will consult for up to 10 weeks depending on the potential impact of our proposals.

A2.6 A person within Ofcom will be in charge of making sure we follow our own guidelines and reach out to the largest number of people and organisations interested in the outcome of our decisions. Ofcom's 'Consultation Champion' will also be the main person to contact with views on the way we run our consultations.

A2.7 If we are not able to follow one of these principles, we will explain why.

After the consultation

A2.8 We think it is important for everyone interested in an issue to see the views of others during a consultation. We would usually publish all the responses we have received on our website. In our statement, we will give reasons for our decisions and will give an account of how the views of those concerned helped shape those decisions.

Annex 3

Consultation response cover sheet

A3.1 In the interests of transparency and good regulatory practice, we will publish all consultation responses in full on our website, www.ofcom.org.uk.

A3.2 We have produced a coversheet for responses (see below) and would be very grateful if you could send one with your response (this is incorporated into the online web form if you respond in this way). This will speed up our processing of responses, and help to maintain confidentiality where appropriate.

A3.3 The quality of consultation can be enhanced by publishing responses before the consultation period closes. In particular, this can help those individuals and organisations with limited resources or familiarity with the issues to respond in a more informed way. Therefore Ofcom would encourage respondents to complete their coversheet in a way that allows Ofcom to publish their responses upon receipt, rather than waiting until the consultation period has ended.

A3.4 We strongly prefer to receive responses via the online web form which incorporates the coversheet. If you are responding via email, post or fax you can download an electronic copy of this coversheet in Word or RTF format from the 'Consultations' section of our website at http://stakeholders.ofcom.org.uk/consultations/consultation-response-coversheet/.

A3.5 Please put any parts of your response you consider should be kept confidential in a separate annex to your response and include your reasons why this part of your response should not be published. This can include information such as your personal background and experience. If you want your name, address, other contact details, or job title to remain confidential, please provide them in your cover sheet only, so that we don't have to edit your response.

Cover sheet for response to an Ofcom consultation

BASIC DETAILS

Consultation title:

To (Ofcom contact):

Name of respondent:

Representing (self or organisation/s):

Address (if not received by email):

CONFIDENTIALITY

Please tick below what part of your response you consider is confidential, giving your reasons why

Nothing ☐

Whole response ☐

Part of the response ☐

Name/contact details/job title ☐

Organisation ☐

If there is no separate annex, which parts?

If you want part of your response, your name or your organisation not to be published, can Ofcom still publish a reference to the contents of your response (including, for any confidential parts, a general summary that does not disclose the specific information or enable you to be identified)?

DECLARATION

I confirm that the correspondence supplied with this cover sheet is a formal consultation response that Ofcom can publish. However, in supplying this response, I understand that Ofcom may need to publish all responses, including those which are marked as confidential, in order to meet legal obligations. If I have sent my response by email, Ofcom can disregard any standard e-mail text about not disclosing email contents and attachments.

Ofcom seeks to publish responses on receipt. If your response is non-confidential (in whole or in part), and you would prefer us to publish your response only once the consultation has ended, please tick here. ☐

Name

Signed (if hard copy)

Annex 4

Consultation questions

Question 3.1: Do you agree with our proposal to use an Inflation-X form of charge control? If not, what alternative would you propose and why?

Question 3.2: Do you agree with the use of CPI as the relevant benchmark for inflation? If not, what alternative would you propose and why?

Question 3.3: Do you agree with our proposal for the duration of the charge controls to be three years? If not, what alternative would you propose and why?

Question 4.1: Do you agree with our proposed five stage framework setting out the key economic principles that we propose to take into account in designing our proposed charge controls? If not, what alternative would you propose and why?

Question 5.1: Do you agree with our proposal to adopt broad baskets for leased lines services, but separate TI and Ethernet baskets? If not, what alternative would you propose and why?

Question 5.2: Do you agree with our approach to deriving our base year costs for Ethernet and TI services, including:

a. *our proposal to forecast costs based on BT's costs of providing business connectivity services;*
b. *our proposal to apply CCA FAC as our cost standard; and*
c. *our proposal that the base year for the 2015 LLCC Model is the financial year 2013/14 and that our base year for the model for the 2016 BCMR Statement should be the financial year 2014/15?*

If not, what alternative would you propose and why?

Question 5.3: Do you agree with our approach to forecasting costs and revenues over the period of the charge controls for Ethernet and TI services, including:

a. *our AVEs and CVEs assumptions;*
b. *our input price inflation assumptions; and*
c. *our WACC assumptions?*

If not, what alternative would you propose and why?

Question 5.4: Do you agree with our proposals in relation to the types of discount that would contribute towards BT meeting its charge control obligations for Ethernet and TI services? If not, what alternative would you propose and why?

Question 6.1: Do you agree with our basket design proposals for Ethernet services, including the need for sub-caps and/or sub-baskets? If not, what alternative would you propose and why?

Question 6.2: Do you agree with our approach to deriving our base year costs for Ethernet services, including in particular:

a. *our proposal in relation to the technology assumed for supplying controlled Ethernet services for modelling purposes;*
b. *our proposed cost adjustments to BT's 2013/14 RFS to form the base year costs; and*
c. *our proposed treatment of BT's costs relating to QoS?*

If not, what alternative would you propose and why?

Question 6.3: Do you agree with our approach to forecasting costs and revenues over the period of the charge control in relation to Ethernet services, including in particular:

a. *our volume forecasting assumptions;*
b. *our efficiency forecasting assumptions; and*
c. *our proposal to reflect the impact of the proposed dark fibre remedy?*

If not, what alternative would you propose and why?

Question 6.4: Do you agree with our proposals in relation to starting charge adjustments for Ethernet services? If not, what alternative would you propose and why?

Question 6.5: Do you agree with our proposals in relation to the value of X for Ethernet services. If not, what alternative would you propose and why?

Question 7.1: Do you agree with our basket design proposals for TI services, including the need for sub-caps and/or sub-baskets? If not, what alternative would you propose and why?

Question 7.2: Do you agree with our approach to deriving our base year costs for TI services, including in particular:

a. *our proposal in relation to the technology assumed for supplying controlled TI services for modelling purposes; and*
b. *our proposed cost adjustments to BT's 2013/14 RFS to form the base year costs?*

If not, what alternative would you propose and why?.

Question 7.3: Do you agree with our approach to forecasting costs and revenues over the period of the charge control in relation to TI services, including in particular:

a. *our volume forecasting assumptions; and*
b. *our efficiency forecasting assumptions?*

If not, what alternative would you propose and why?

Question 7.4: Do you agree with our proposals in relation to starting charge adjustments for TI services? If not, what alternative would you propose and why?

Question 7.5: Do you agree with our proposals in relation to the value of X for TI services. If not, what alternative would you propose and why?

Question 8.1: Do you agree with our proposals regarding dark fibre pricing? If not, what alternative would you propose and why?

Question 9.1: Do you agree with our proposals for charge controls for accommodation? If not, what alternative would you propose and why?

Question 9.2: Do you agree with our proposals for charge controls for ECCs? Please explain your answer with supporting information.

Question 9.3: Do you agree with our proposals for charge controls for TRCs? If not, what alternative would you propose and why?

Question 10.1: Do you agree with our proposals for implementation of the proposed new charge controls and for ensuring compliance with the proposed new charge controls. If not, what alternative would you propose and why?

Question 11.1: Do you agree with our proposals for BT's Regulatory Financial Reporting, including in particular:

a. *the proposed Consistency with Regulatory Decisions Direction; and*
b. *the proposed Direction modifying requirements relating to the preparation, audit, delivery and publication of the Regulatory Financial Statements, and Direction modifying requirements relating to the form and content of the Regulatory Financial Statements?*

If not, what alternative would you propose and why?

Annex 5

Analysis of BT's 2013/14 financial performance

Introduction

A5.1 This annex sets out our analysis of BT's financial performance in the business connectivity markets in 2013/14.

A5.2 The 2013 LLCC came into force on 1 April 2013. BT's latest RFS published in August 2014, upon which our proposals in this consultation are based, provides outturn financial information for the first year of the 2013 LLCC.[1] In this annex we consider the extent to which BT's outturn financial performance for the charge controlled business connectivity services in 2013/14 has diverged from our forecasts when setting the 2013 LLCC. In particular we:

- compare the 2013 LLCC forecast CCA FAC rates of return on mean capital employed for the financial year 2013/14 with BT's outturn financial data for the same period;
- undertake a review of the factors that have led to outturn financial performance diverging from forecasts; and
- estimate the likely scale of these potential factors by re-modelling the alternative assumptions.

A5.3 This analysis provides background and context to the June 2015 LLCC Consultation and has been considered in our proposals as set out in this document.

Summary of our conclusions and proposals

A5.4 The 2013 LLCC sought to bring BT's charges for leased lines into line with its WACC by 2015/16. The financial year 2013/14 was the first year of this control, and under our glidepath approach, the 2013 LLCC Model forecast that BT would earn a ROCE of approximately 15-16%. By contrast, BT's outturn returns[2] in 2013/14 were between 29% and 30%. Given the scale of this divergence, we have undertaken an analysis of the factors behind BT's profitability.

A5.5 We have identified a number of factors that help us explain this divergence between the forecast and outturn rates of return. In Figure A5.1 below, we group these factors into four broad categories and present our estimate of the impact of each on the returns for the combined TI and Ethernet baskets:

[1] BT, *Current cost financial statements 2014 including Openreach Undertakings, Statement by Ofcom*, http://www.btplc.com/Thegroup/RegulatoryandPublicaffairs/Financialstatements/2014/Current_Cost_Financial_Statement_2014.pdf

[2] In setting the 2013 LLCC Ofcom made a number of adjustments to BT's base financial information to ensure it provided an appropriate basis for forecasting. We have adopted a comparable set of adjustments to BT's 2013/14 financial information to derive the outturn rate of return of 29.2% in 2013/14.

- BT RFS changes – BT has made a number of (unanticipated) changes to its accounting treatment of business connectivity services in recent years which have had an impact on reported profitability (based on CCA FAC). These changes mostly move costs out of the business connectivity markets and into other markets, including Fixed Access markets for example;

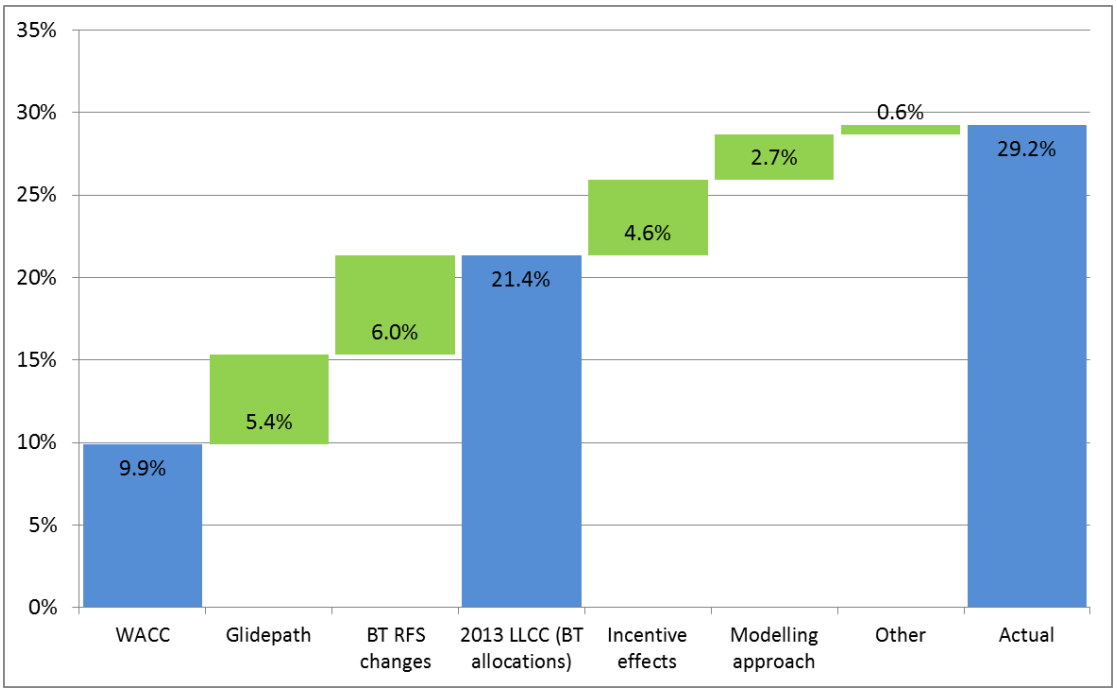
- incentive effects – Ofcom's implementation of charge controls on BT provides it with incentives to outperform our volume and efficiency assumptions. Such outperformance can result in outturn rates of return in excess of WACC. Outperformance in relation to TI services in particular appears to have also contributed to higher than forecast rates of return;

- modelling approach – Ofcom's approach to modelling charge controls involves some degree of simplification and therefore inevitably involves a risk of forecast inaccuracy. Although we would expect such effects to be symmetric in nature ex ante, i.e. equally likely to under-estimate as to over-estimate costs, in the case of business connectivity services it appears that our modelling approach may have over-estimated BT's costs of provision; and

- other (unexplained) – this unexplained residual is the difference between the outturn and the effects that we have been able to quantify.

A5.6 As Figure A5.1 below shows, each of the first three categories listed above has had a significant impact on forecast accuracy. However the largest effect is in relation to BT's RFS changes made subsequent to the 2011/12 RFS (which was used as the basis for the 2013 LLCC). After taking account of these changes in accounting treatment, the overall difference between the 2013 forecast and the outturn is equivalent to an approximately 8% difference in BT's return on capital employed (ROCE).

Figure A5.1: Disaggregating the difference between BT's forecast and outturn return on (mean) capital employed across both the TI and Ethernet baskets, 2013/14



Source: Ofcom modelling

A5.7 Supported by our analysis of BT's 2013/14 outturn rates of return we propose to make a number of changes for the 2016 LLCC:

- making a number of **adjustments to the base year financial information** provided by BT, including changing the allocations of certain costs following our recent detailed review of BT's regulatory reporting cost allocations. Our adjustments are set out in detail in Annex 7;
- making some **starting charge adjustments** in relation to both Ethernet and TI services, as set out in Sections 6 and 7;
- revising our **efficiency assumptions**, particularly in relation to TI services, as set out in Annex 8;
- revising the methodology and data we use for estimating **AVEs[3] and CVEs[4]**, as set out in Annex 8; and
- making a number of **detailed changes to our modelling** as set out in Annex 6. The main changes to our cost forecasting equations result in a set of equations that are more consistent with those used in the recent LLU and WLR control.

Our response to stakeholders' comments

A5.8 We received a number of stakeholder representations on BT's profitability in business connectivity markets both in response to our Call for Inputs and more generally in the run up to this consultation.

A5.9 Some stakeholders[5] considered BT's profits to be "*excessive*"[6] and Sky outlined the negative impacts of "*excessive pricing*"[7]. TalkTalk and Verizon identified certain services in the business connectivity markets where BT continues to report returns above the WACC.[8] These stakeholders argued that Ofcom should consider how this excessive profit arose. Verizon did not consider these returns to be *"justified entirely by efficiency increases"*.[9]

A5.10 In this Annex we address these stakeholder observations by considering how BT's relatively high rates of return in business connectivity markets have arisen.

[3] Asset Volume Elasticities (AVEs) (defined as the percentage increase in assets required for a 1% increase in volume) are used to determine the level of capital costs in response to changes in demand.
[4] Cost Volume Elasticities (CVEs) (defined as the percentage increase in operating costs for a 1% increase in volume) are used to determine the level of operating costs in response to changes in volume.
[5] As discussed in Annex 13 Vodafone (and its consultants Frontier Economics) raised a number of arguments about BT's profitability and how Ofcom should respond to it. We do not repeat these arguments in this Annex.
[6] November 2014 Vodafone's Frontier Economics report; TalkTalk, *Business connectivity market review: response to call for inputs: TalkTalk's response,* May 2014, p.29, http://stakeholders.ofcom.org.uk/binaries/consultations/business-connectivity-market-review/responses/TalkTalk_Group.pdf (TalkTalk's response to April 2014 BCMR CFI); Verizon, *Verizon Enterprise Solutions response to Ofcom's business connectivity review – timetable and initial call for inputs*, p. 11-12, http://stakeholders.ofcom.org.uk/binaries/consultations/business-connectivity-market-review/responses/Verizon.pdf (Verizon's response to April 2014 BCMR CFI).
[7] Sky, *Business connectivity market review: timetable and initial call for inputs: Sky's response*, 16 June 2014, pp. 3-4, http://stakeholders.ofcom.org.uk/binaries/consultations/business-connectivity-market-review/responses/BSKYB.pdf (Sky's response to April 2014 BCMR CFI).
[8] Verizon's response to April 2014 BCMR CFI, p. 11; TalkTalk's response to April 2014 BCMR CFI, p.29.
[9] Verizon's response to April 2014 BCMR CFI, p. 12.

A5.11 BT Wholesale has in the run up to this consultation made representations about the reported profitability of TI services.[10] [✂].[11]

A5.12 [✂].

A5.13 BT Wholesale's suggested adjustments to the TI cost base involve increasing its capital costs for heavily depreciated assets to make them more consistent with those that it would expect a firm to incur in a steady-state. These adjustments are sometimes referred to as 'steady state adjustments' or 'hypothetical on-going network' adjustments. When setting charge controls, Ofcom typically assesses the need for such adjustments on a case-by-case basis. Such assessments will often include the specific objectives of a charge control and the trade-off between seeking to set charges that reflect the economic value of assets used in the short term and avoiding outcomes whereby the regulated firm can over-recover the value of its assets over the longer term.[12] We have not made such adjustments when setting previous charge controls for TI services, including as part of the 2013 LLCC, and consider that it continues to be appropriate to ensure that customers are not required to contribute towards the over-recovery of the assets used to supply TI services. Therefore, in the 2015 LLCC we have not made such adjustments and in this annex we compare our modelled profitability forecasts and the returns reported in the RFS.

The issues and difficulties with financial performance analysis

A5.14 We do not typically undertake detailed analyses of the forecasting accuracy of previous charge control modelling as part of setting the new charge control. Our incentive-based regulatory framework allows BT to outperform our charge control forecasts and retain the benefits of doing so, i.e. we do not act retrospectively when setting the next charge control. However, in this case the apparent divergence between BT's reported profits for charge controlled business connectivity services and those that we forecast when setting the last leased lines charge control is large, and so we have sought to understand the reasons why.

A5.15 Analysing the differences between our charge control forecasts and outturns is complex. Our charge control models are a simplification of reality and will therefore inevitably be subject to some divergence between forecast and outturn. Furthermore, BT's regulatory accounting systems are complex. They typically allocate costs that are not directly attributable to individual cost components and services based on the relative usage of cost items for different services. As the patterns of relative usage change each year, the allocations of non-directly attributable costs will change. As explained in section 4 we do not seek to forecast in our charge control models how the accounting systems will allocate costs over the control period. Fully disentangling such effects without undertaking a very detailed review of individual cost movements is therefore difficult; it would involve extracting considerably more detailed financial information from BT than we use in our, already detailed, charge control models.

[10] BT Wholesale presentation to Ofcom, *Leased Lines Charge Control Ofcom Meeting – TI issues*, 22 January 2015 (BT Wholesale's TI issues presentation).
[11] Slide 5, BT Wholesale's TI issues presentation.
[12] For example, such over-recovery could occur if the regulated firm is initially allowed to set depreciation charges on the basis of accounting lives that are too short, and then subsequently allowed to recover a return on the mean capital employed of assets that have had their values uplifted on the basis of a hypothetical on-going network adjustment.

A5.16 As we are unlikely to be able to identify and quantify all the factors that contribute to any divergence between our forecasts and outturns, we have focused on examining what are likely to be the main factors contributing to the divergence, but there will inevitably be other movements that we have not been able to quantify.[13]

A5.17 As the analysis below shows, the factors we have identified appear to account for a significant proportion of the observed profitability divergence. However, there are some important caveats that are relevant when drawing conclusions from the analysis:

- as we explain further below, we have carried out this exercise by running a number of scenarios within the 2013 LLCC Model that involve changing both input assumptions and aspects of the modelling approach. As some of the parameters we have adjusted depend on each other (e.g. changing the service volumes used in the model affects the impact of changing the CVEs and AVEs used), the results of the exercise vary depending on the sequence that we carry out the scenario tests in;

- most of the impacts we have modelled have involved a degree of judgement as to how to reconcile various information sources. We therefore also recognise that there may be more than one reasonable approach to modelling the impact of some of the adjustments; and

- consistent with the limitations set out above, the findings of our analysis should therefore be considered illustrative of the order of magnitude of the effects identified.

Our approach to estimating the likely impact of the factors identified

A5.18 We have used our 2013 LLCC Model to quantify the impact of the various factors we identified as potentially contributing to the divergence between the outturn and forecast rates of return.

A5.19 The 2013 LLCC Model was based on a particular modelling approach and set of forecasting assumptions, which were explained in the March 2013 BCMR Statement. In the course of developing our model for the next control we have gathered evidence on both: 1) outturn values for 2013/14, e.g. for volumes; and 2) updates to the forecasting assumptions, e.g. for CVEs and AVEs. We have also proposed a number of changes to how we forecast costs, e.g. the forecasting equations adopted.

A5.20 We have therefore been able to make a number of changes to the 2013 LLCC Model to reflect the evidence we have gathered for 2013/14 and some of the modelling changes we have proposed in this consultation. In Table A5.1 below, we explain our approach to modelling each of the changes quantified.

[13] For example, we have made a number of detailed changes to the modelling we have adopted in this control, such as, changes to the forecasting equations used and the level of granularity adopted for the modelling (we are using more granular data for components rather than super-components). It is not possible to model the impact of all these changes without rebuilding the 2013 LLCC Model and sourcing additional information from BT, which we consider to be neither practical nor proportionate.

Table A5.1: Our changes to the 2013 LLCC Model to quantify the impact of the various possible factors contributing to the divergence in forecast and outturn profitability

	How the impact is implemented in the 2013 LLCC Model
BT's RFS methodology changes	Adjusted 2013 LLCC Model forecast of 2013/14 costs by the cash impact on Total CCA Operating Costs and MCE of BT's changes to its RFS allocation methodologies in 2012/13 and 2013/14.[14]
BT's RFS allocation data changes	Adjusted 2013 LLCC Model forecast of 2013/14 costs by the cash impact on MCE of BT's changes to the cost allocations used in its Core Transmission Costing System (CTCS) system.[15]
Update volumes to actuals	Updated 2013 LLCC Model with actual volumes for 2012/13 and 2013/14.
Update with latest efficiency estimates	Set the efficiency assumption to 5% for opex and capex for both TI and Ethernet services, based on analysis of BT's historical efficiency set out in Annex 8.
Change to the modelling of GRC	For this consultation, we have changed the approach to forecasting GRC to more accurately reflect the accounting treatment of asset disposals. We have estimated the impact of this change by changing the additional GRC formula used in the 2013 LLCC Model to: GRC(t-1) * [1+Input price changes(t)] + Add Capex(t).
Update the CVEs and AVEs to 2015 model values	Set CVEs and AVEs to the values used in this consultation model, which is based on updated outputs from BT's LRIC model.
Other	Obtained outturn 2013/14 profitability using this consultation model (e.g. using comparable services and base year adjustments) and calculated difference between outturn and modelled scenarios.

Source: Ofcom

Our 2013 LLCC forecasts of BT's profitability for 2013/14 versus BT's reported profitability

A5.21 In the following paragraphs we set out our analysis of how our 2013 LLCC forecasts compare with BT's outturn financial performance for 2013/14. We start by considering the financial performance for the combined TI and Ethernet baskets used in the 2013 LLCC.[16] We then separately consider the same analysis for the TI basket and the Ethernet basket.

Combined TI and Ethernet baskets

A5.22 In Table A5.2 we present four different rates of return for the combined TI and Ethernet baskets in 2013/14:

- BT's pre-tax nominal WACC – this was Ofcom's assessment in 2013 of BT's cost of capital relevant to business connectivity services;

[14] We obtained information on the financial impact of BT's RFS methodology changes: 2013/14 BT Report requested by Ofcom and 2014/15 BT Report requested by Ofcom.
[15] BT provided information on the financial impact of its CTCS changes in response to the 18th s.135 request of 27 April 2015.
[16] As this analysis is based on the 2013 LLCC, it includes services not covered by the proposed 2016 control (for example, the 2016 control does not propose to include 34/45Mbit/s and 140/155Mbit/s TI services).

- 2013 LLCC Model forecast – this was our forecast of BT's 2013/14 rate of return on the combined TI and Ethernet baskets in the 2013 LLCC Model;[17]

- Ofcom adjusted outturn, using 2013 LLCC adjustments – this is our estimate of BT's outturn returns on the combined TI and Ethernet baskets on the basis of applying the same adjustments made by Ofcom in the 2013 LLCC;[18] and

- Ofcom adjusted outturn, using all 2016 LLCC proposed adjustments - this is our estimate of BT's outturn returns on the combined TI and Ethernet baskets on the basis of all the adjustments to BT's financial information we are proposing to make in this charge control. For a list of the proposed adjustments see Annex 7.

A5.23 When we impose charge controls on BT's business connectivity services we typically start with detailed financial information provided by BT from its regulatory financial reporting systems. However, to ensure that the information is appropriate for setting charges, we typically make adjustments to the data. These adjustments can correct for errors identified in the regulatory accounts, alter cost allocations, or seek to reflect policy decisions we have taken for the purposes of setting charges, e.g. the RAV.

A5.24 As part of this review process we have subjected BT's regulatory financial information to considerable scrutiny to determine whether changes are required for the 2016 LLCC. This review has identified a number of changes that we propose to make. These are set out in detail in Annex 7. In some cases these changes are the same (or similar) to those we made in 2013. While in other cases they reflect new changes we have identified as part of this review process. The changes typically work to reduce operating costs (including depreciation) and MCE. The higher rate of return in the fourth row of Table A5.2, compared to row three, reflects the impact of the additional adjustments we are proposing to make for this charge control compared to the 2013 LLCC, as set out in Annex 7. In order to ensure comparability we have sought to ensure that a consistent set of Ofcom adjustments are applied to the 2013 LLCC forecasts[19] and the outturn financial information supplied by BT.[20] We therefore use the outturn rate of return in row three (i.e. 29.2%) for the analysis below.

[17] We have used the outputs from the "BasketX.BTW" and "BasketX.OR" sheets in relation to forecast revenues, costs and MCE for the two baskets to calculate this rate of return for the combined basket. For comparability purposes we have turned off the MEA adjustments made in the 2013 model for Ethernet services (as explained below). In our forecast of 2013/14 profitability, we have also included the impact of the cost reallocation between the TI and Ethernet baskets by assuming that an equal share of TI customers migrate to Ethernet services in each year between 2011/12 and 2015/16.

[18] These include the RAV adjustment; the removal of MCE associated with transmission equipment; and the removal of direct access cards costs.

[19] In the 2013 LLCC we made a number of adjustments to the assumed technology used to deliver legacy Ethernet services (i.e. a series of changes to the assumed MEA). The impact of these MEA changes was to reduce the forecast cost base for Ethernet services. We propose to make similar changes for the forthcoming charge control. However, to improve the consistency with BT's RFS we have based our profitability on financial information excluding the impact of our MEA changes.

[20] We do so by seeking to apply the same set of adjustments to the information supplied by BT. In the case of the 2013/14 outturn information we use updated financial information to implement the adjustments. Therefore, although we apply the same set of broad adjustments, the scale of adjustment varies between the forecasts and outturns to reflect relevant changes to the underlying information over the period.

Table A5.2: Return on (mean) capital employed across both the TI and Ethernet baskets, % 2013/14

	% ROCE	Diff, %
BT pre-tax nominal WACC[21]	9.9%	-
2013 LLCC Model forecast	15.3%	+5.4%
Ofcom adjusted outturn, using 2013 LLCC adjustments	29.2%	+13.9%
Ofcom adjusted outturn, using all 2016 LLCC proposed adjustments	31.6%	+2.4%

Source: Ofcom modelling

A5.25 As Table A5.2 shows, in setting the 2013 LLCC we anticipated that BT's returns on its charge controlled business connectivity services would exceed its cost of capital (i.e. its WACC) by 5.4%. This reflects our use of a glide-path to bring charges into line with forecast costs at the end of the control period, rather than at the start of the control period. Given that 2013/14 was the first year of the control period, we would not necessarily expect BT's returns to equal the cost of capital as there were still two years of glide-path reductions in charges to be made to bring charges into alignment with forecast costs.

A5.26 However, as the third row of Table A5.2 shows, BT's adjusted outturn returns in 2013/14 were significantly above the level we forecast in the 2013 LLCC (i.e. 29.2% compared to 15.3%). Indeed, the rate of return on a like-for-like basis appears to have been nearly double that which we were forecasting for the 2013 LLCC.

A5.27 Our top-down approach to forecasting BT's costs for leased lines charge controls starts with BT's RFS financial information for the base year of the control (which is often two years before the start of the control). We then forecast cost changes over the control period based on forecast changes in input prices; efficiency; and volumes using CVEs and asset-volume elasticities AVEs. Therefore, in broad terms, any departure of outturn profitability compared to forecast will reflect either:

- changes in BT's accounting treatment for the services in question over the control period;
- some form of departure from our assumed input price, efficiency or volume change assumptions; and/or
- our approach to modelling the various impacts to profitability, perhaps reflecting that charge control models are inherently simplifications so some departures are inevitable.

A5.28 On the basis of these possible causes for the profitability divergence observed, we have identified a number of important factors that seem to contribute to this divergence between the forecast and outturn profitability in this case. In Table A5.3 below, we present a disaggregation of each of the broad categories.

[21] The 2013 LLCC was modelled in real terms. Therefore the reported rates of return were also in real terms. This is different to the 2015 LLCC Model which is based on nominal rates of return. We have therefore converted the 2013 LLCC Model ROCE outputs from real to nominal.

Table A5.3: Detailed disaggregation of the difference between BT's forecast and outturn return on (mean) capital employed across both the TI and Ethernet baskets, 2013/14

	% ROCE	% Diff
Starting ROCE for 2013/14 in the 2013 LLCC Model	15.3%	
BT's RFS methodology changes	22.8%	+7.5%
BT's RFS allocation data changes	21.4%	-1.4%
Incentive effects		
Update volumes to actuals	25.0%	+3.6%
Update with latest efficiency estimates	25.9%	+0.9%
Modelling approach		
Change to the modelling of GRC	27.7%	+1.7%
Update the CVEs and AVEs to 2015 model values	28.7.%	+1.0%
Other	29.2%	-0.6%

Source: Ofcom modelling

Changes to BT's RFS and cost allocation systems

A5.29 As Table A5.3 shows the largest single effect identified relates to changes to BT's RFS. This includes some significant changes to BT's allocation methodologies. It also includes some changes to how costs are allocated within its RFS methodology.

A5.30 The allocation methodology changes, which occurred in both the 2012/13 and 2013/14 RFS, are those reported by BT each year in its publication illustrating the impact of certain changes to the Accounting Documents.[22] BT made these changes in the years subsequent to the 2011/12 RFS used for the 2013 LLCC.[23] The overall effect of these changes is to remove significant amounts of costs from business connectivity markets. We consider BT's changes to its accounting treatment of business connectivity market services in our discussion of starting charge adjustments in Sections 6 and 7.

A5.31 In addition to the RFS methodology changes, BT has also made some changes to its cost allocation systems that it uses as the basis for allocating certain costs relevant to leased lines in line with its RFS methodology. As these changes were not in relation to methodology, but the data used to implement the methodology, they did not appear in BT's publications on changes to the Accounting Documents.[24] These changes have different effects on Ethernet (they add costs) and TI (they remove costs) but in combination offset some of the impact of the RFS methodology changes across the two baskets taken as a whole.

[22] For example, 2014/15 BT Report requested by Ofcom.
[23] We do not object to these changes in principle, although we did not accept them in the June 2014 FAMR Statement as there was a risk of over-recovery if the March 2013 LLCC Statement and the June 2014 FAMR Statement used inconsistent allocations.
[24] [✂].

Incentive effects

A5.32 Of the two main incentive effects, namely forecast volumes and efficiency, volumes appear to be more significant in explaining the profitability under-forecast.

A5.33 As set out in Table A5.1 above, for this analysis we have updated the 2013 LLCC Model to include actual volumes and our best estimate of outturn efficiency improvements for 2012/13 and 2013/14.

A5.34 Our forecasts for efficiency appear to have been relatively accurate for Ethernet services, based on the evidence available to us, whereas there appears to have been a greater divergence in relation to TI services as shown below. However, our volume forecasts were subject to greater divergence against outturn. Again as we show below, the volume impact is greater for TI than Ethernet. Our understanding is that a significant driver of this relates to a slower decline than expected in 2Mbit/s volumes in 2013/14. However, our volume forecasts for the 2015 LLCC Model suggest that this decline is expected to be made up in subsequent years so we anticipate this impact to reduce by the end of the current control period.

The modelling approach

A5.35 Our modelling approach may also have been a contributing factor, but the effect is more limited than the above two effects. As set out above, we have undertaken a detailed review of our modelling approach, particularly in relation to capital costs. This has involved us proposing a number of detailed modelling changes, many of which improve the consistency of the modelling with the recent WLR/LLU charge control. As it is not proportionate or feasible to rebuild the 2013 model and source the additional data needed from BT to run the rebuilt model, we are unable to quantify the impact of most of these changes. However, we have quantified the effect of two particular aspects of the modelling approach:

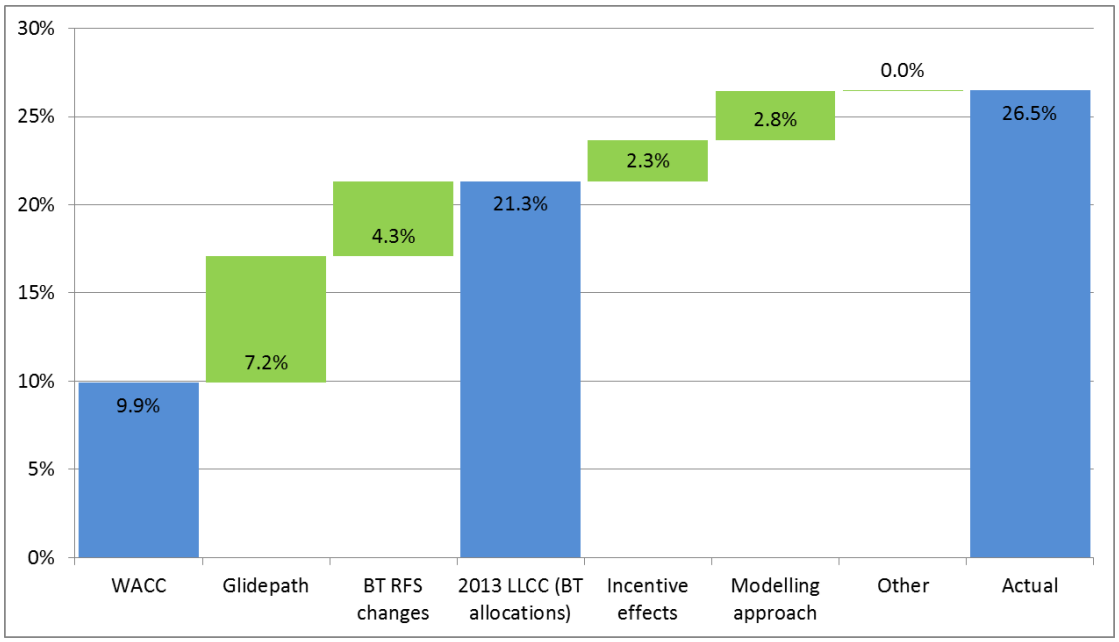
- first, we have amended the modelling of GRC to revise the treatment of asset disposals. This change more closely follows the underlying accounting treatment of these costs. We set out our proposed forecasting treatment for GRC, and our modelling approach more generally, in Annex 6; and

- second, we have undertaken a detailed review of both the methodology and data used to historically estimate the CVEs and AVEs that are a key input to our top-down modelling approach. We consider that we have made a number of improvements to these important inputs for the 2015 LLCC Model, as we explain in Annex 8.

Ethernet basket

A5.36 In Figure A5.2 and Table A5.4 below we reproduce Figure A5.1 and Table A5.3 presented above, but for the Ethernet basket only.

Figure A5.2: Disaggregating the difference between BT's forecast and outturn return on (mean) capital employed for the Ethernet basket, 2013/14



Source: Ofcom modelling

Table A5.4: Detailed disaggregation of the difference between BT's forecast and outturn return on (mean) capital employed for the Ethernet basket, 2013/14

	% ROCE	% Diff
Starting ROCE for 2013/14 in the 2013 LLCC Model	17.1%	
BT's RFS methodology changes	25.3%	8.2%
BT's RFS allocation data changes	21.3%	-4.0%
Incentive effects		
Update volumes to actuals	23.2%	+1.9%
Update with latest efficiency estimates	23.7%	+0.4%
Modelling approach		
Change to the modelling of GRC	25.8%	+2.1%
Update the CVEs and AVEs to 2015 model values	26.5%	+0.7%
Other	26.5%	+0.0%

Source: Ofcom modelling

A5.37 As Figure A5.2 and Table A5.4 show, the broad conclusions from the combined basket are generally also relevant for the Ethernet basket. However, there are some specific points of note:

- overall forecasting accuracy seems to have been better for Ethernet than the combined basket, and therefore also better than for TI;
- as a result of the two different changes to BT's RFS working in the opposite direction (i.e. the methodology changes take cost out, while the changes to BT's

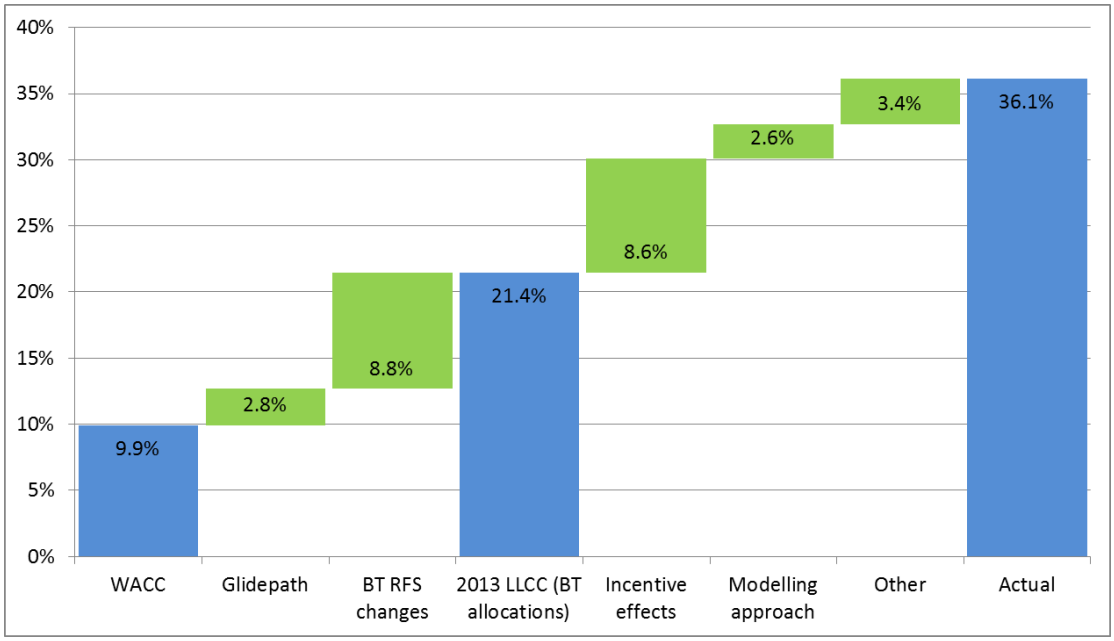
cost allocation systems add cost into Ethernet), the overall impact on BT's ROCE of these two effects is less pronounced than for the combined basket, and therefore for TI, although it still accounts for almost half the divergence;

- the incentive effect impact is also smaller than for the combined basket. As noted above, and shown below, both our volume and efficiency forecasts for Ethernet were more accurate than for TI; and
- the impact of the proposed changes to our modelling approach appear to have a greater impact for Ethernet than for the combined basket, and therefore TI.

TI basket

A5.38 In Figure A5.3 and Table A5.5 below we reproduce Figure A5.1 and Table A5.3, but for the TI basket only.

Figure A5.3: Disaggregating the difference between BT's forecast and outturn return on (mean) capital employed for the TI basket, 2013/14



Source: Ofcom modelling

Table A5.5: Detailed disaggregation of the difference between BT's forecast and outturn return on (mean) capital employed for the TI basket, 2013/14

	% ROCE	% Diff
Starting ROCE for 2013/14 in the 2013 LLCC Model	12.7%	
BT's RFS methodology changes	19.3%	+6.6%
BT's RFS allocation data changes	21.4%	+2.2%
Incentive effects		
Update volumes to actuals	28.2%	+6.8%
Update with latest efficiency estimates	30.1%	+1.8%
Modelling approach		
Change to the modelling of GRC	31.1%	+1.0%
Update the CVEs and AVEs to 2015 model values	32.7%	+1.6%
Other	36.1%	+3.4%

Source: Ofcom modelling

A5.39 As Figure A5.3 and Table A5.5 show, the broad conclusions from the combined basket are generally also relevant for the TI basket. However, there are some specific points of note:

- BT's RFS changes both work in the same direction for TI, i.e. they both reduce TI costs. As a consequence, changes to BT's RFS contribute more than a third of the difference between the forecast and outturn returns;
- as noted above, the incentive effect impacts are larger for TI than Ethernet. Our latest estimates of efficiency imply BT Wholesale has been achieving a rate of efficiency improvement of around 5% per annum in recent years, across capital expenditure and operating expenditure. This compares to our assumed rate of efficiency improvement of 1.5% for operating expenditure and 0% for capital expenditure. Our proposed efficiency assumptions are explained in Annex 8;
- a divergence of 2013/14 volumes from forecast accounts for a significant proportion of the higher ROCE. However, we expect this impact to reduce over the charge control period. As noted above, BT's out-performance in relation to volumes appears to relate to a forecast decline in 2Mbit/s circuits being delayed, and we anticipate a much smaller divergence in 2015/16. We therefore expect this outperformance to be made up by the end of the current control period. Our volume forecasting analysis is also set out in detail in Annex 8; and
- the amount of the divergence we are unable to explain is larger for TI services (~3.4%).

Annex 6

LLCC Model

Introduction

A6.1 We have developed a revenue and cost forecasting model (2015 LLCC Model) in order to calculate values of X for the TI and Ethernet baskets in the charge control. For each basket, we have proposed that BT will be required to ensure that its charges for the services in question do not increase by more than CPI plus or minus the value of X. In Section 4, we discuss our approach to designing the charge control framework, which provides background to the more detailed aspects covered by this Annex.

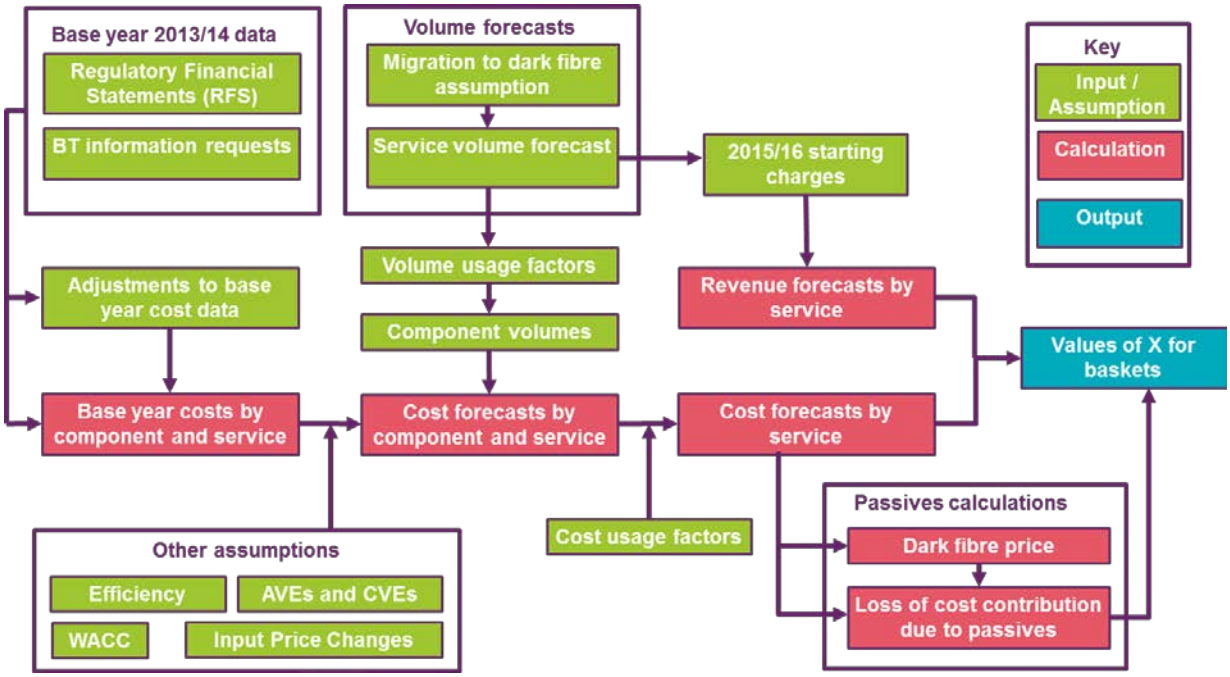
A6.2 In this Annex, we:

- provide an overview of the 2015 LLCC Model;
- explain our revenue forecasting approach;
- explain our cost forecasting approach;
- discuss some detailed modelling issues; and
- set out the values of X we have calculated, including sensitivity analysis.

Overview of model structure

A6.3 The objective of the 2015 LLCC Model is to forecast how the efficient costs of providing the relevant business connectivity services will change over the period of the charge control. In developing the 2015 LLCC Model, we have updated the approach used for the 2013 LLCC to take into account market developments and the latest available evidence (e.g. see Annex 5 on BT's financial performance in 2013/14). We have structured the 2015 LLCC Model as illustrated in Figure A6.1 below.

Figure A6.1: The 2015 LLCC Model proposed structure



A6.4 In summary, we first calculate the base year costs for services within business connectivity markets. For the June 2015 LLCC Consultation, the base year of the charge control model is 2013/14.[25] The base year cost data comes from BT's 2013/14 RFS, as well as data supplied by BT in response to a number of formal s135 information requests. We make a number of adjustments to these data to reflect our view of forward looking efficient costs. In Annex 7, we set out the adjustments we have made to BT's base year costs.

A6.5 Second, we forecast revenues in each year until the end of the charge control. These forecasts are based on two inputs; the charges for each service that we expect to be in place during the control; and the volumes of each service. We explain our approach to determining charges below and we explain our volume forecasts in Annex 8.

A6.6 Third, we forecast costs for each year of the period ending 2018/19. We forecast how costs will vary from the base year over the modelling period on the basis of: i) volume changes, the impact of which are determined by cost-volume and asset-volume elasticities; ii) efficiency; and iii) input price changes. Annex 8 describes the forecasting assumptions we have used.

A6.7 Fourth, we calculate the cost uplifts necessary as a result of our proposed dark fibre remedy. This includes an uplift to reflect:

- the loss of fixed and common cost contribution as a result of active services migrating to dark fibre. As explained in Section 6, the lost cost contribution is added into the charge control (specifically the Ethernet basket); and

[25] We intend to update the base year of the charge control model to 2014/15 for the 2016 BCMR Statement.

- the dark fibre implementation costs. We discuss why we consider these costs should be recovered from the Ethernet basket, as well as what an appropriate level would be.

A6.8 In this section we provide details of our calculations.

A6.9 Finally, based on our basket definitions, we divide up forecast costs and revenues into the TI and Ethernet baskets and calculate the values of X for each. Based on our glide path approach, the value of X is calculated to gradually bring revenues in line with costs such that in the final year of the control revenues equal our forecast of efficiently incurred costs. At the end of this section we explain how we calculate the value of X. In addition, we present the results of our sensitivity analysis.

Revenue forecasting approach

A6.10 In order to forecast revenues for services in our TI and Ethernet baskets, we require two inputs:

- service charges; and
- volume forecasts.

A6.11 We explain how we have produced our volume forecasts in Annex 8. In terms of service charges, we obtained data on BT's average revenues by service for 2013/14 as well as the charges that were in place at the end of the first year of the current control (2013/14) and at the start of years two (2014/15) and three (2015/16). These charges are based on the BT Wholesale[26] and Openreach[27] price lists and were confirmed in a formal s135 information request.[28]

A6.12 In order to forecast revenues during the control period, we need to determine what the charges will be for services in our basket in each year of the control. For the purposes of the current consultation, we have used the BT Wholesale and Openreach charges that were in effect on 1 April 2015 as our starting point. For Ethernet services, we make an adjustment to reflect the fact that Openreach is planning further reductions later in the year (this is discussed below).

A6.13 When we publish the final 2016 LLCC Statement, we will use the most recent charges available with the aim of taking into account charges immediately before the beginning of the charge control (i.e. on 31 March 2016). This is consistent with our approach in the 2013 LLCC.[29]

A6.14 The use of the charges that are published in the BT Wholesale and Openreach price lists have raised various detailed modelling issues, for example differences in how certain services are charged for in the price list and how they are treated in BT's regulatory accounts. We discuss these issues and the resulting adjustments we made below.

[26] BT Wholesale, Carrier Price List, https://www.btwholesale.com/pages/static/help-and-support/pricing/carrier-price-lists.htm
[27] Openreach, Ethernet services price list, https://www.openreach.co.uk/orpg/home/products/pricing/loadProductPrices.do?data=2qYKQipGu8lEldEpdH2SyFnqs1m6OcKz301sgolk8P2FdiaKKPEfrCsJCb3sZkzJ
[28] BT response dated 4 March 2015 to questions A1 and A2 of the 13th s135 notice dated 26 February 2015.
[29] Paragraphs A12.199-a12.216 of the March 2013 BCMR Statement.

Starting charge analysis

A6.15 Having made certain adjustments to BT's 1 April 2015 charges, we then carry out our starting charge analysis. As set out in Section 4, our principles for making starting charge adjustments are as follows:

- distorted pricing signals – we compare BT's aggregate charges for each service with their costs using 2016/17 forecast data in order to mitigate the risk of excessive or anti-competitive pricing; and

- changes in cost allocations (and accounting errors) between regulated and unregulated markets – where these are material we impose a starting charge adjustment in order to remove any competitive distortion in wholesale Ethernet or TI markets.

A6.16 In this sub-section, we explain how we have carried out these analyses. Both of them use our cost model, which forecasts the fully allocated cost for each leased line service from 2013/14 to 2018/19. These costs include a number of base data adjustments, set out in Annex 7.

A6.17 In order to carry out our starting charge analyses, we require two cost estimates for each service in 2016/17 (the first year of the control): one that includes all base data adjustments; and one that excludes the adjustments that move costs between BCMR and unregulated markets. In order to generate this, we therefore run two versions of our forecast model.

Distorted pricing signals

A6.18 In order to assess whether any of BT's charges run the risk of significantly distorting consumption or investment decisions, we compare BT's charges for each service with three different measures of cost in 2016/17: FAC, DSAC and DLRIC in 2016/17. The FAC forecasts are produced using our cost model, excluding the adjustments that move costs between BCMR and unregulated markets. This is because we consider the latter as a separate starting charge adjustment and so including them in this analysis would result in implementing an adjustment twice.[30]

A6.19 In order to forecast DSAC and DLRIC, we requested service-level DSAC and DLRIC data from BT based on data for 2013/14.[31] This information allows us to calculate DSAC- and DLRIC-to-FAC ratios for 2013/14. We then apply these ratios to our FAC forecasts in 2016/17 to derive forecast DSAC and DLRIC estimates for each service, i.e. we assume the ratios are constant going forward. This is consistent with the approach we adopted in the 2013 LLCC.

[30] To illustrate this, suppose BT charged £200 for a service and the fully adjusted FAC (i.e. excluding costs that should be allocated to unregulated markets) was £60. Including the costs that should be allocated to unregulated markets gives a FAC of £80. For the purposes of analysing distorted pricing signals, we compare the £200 charge with £80 rather than £60. For example, if we wanted to bring the charge down to double FAC then we would set an initial adjustment of -20% (to go from £200 to £160). This is because we then consider the cost allocations as a second starting charge adjustment. Specifically in this case, removing the inappropriate cost allocations reduces the FAC by 25% (i.e. from £80 to £60). Under our methodology, we would therefore impose a second starting charge adjustment of -25%. However, as set out in Sections 6 and 7, we propose to give BT flexibility to implement the second adjustment as this is consistent with our decision to design broad baskets. This is why it is separate to the first adjustment for distorted pricing signals, which would apply to specific services rather than the broader basket.

[31] BT updated response dated 23 April 2015 to question I3 of the 1st s135 notice dated 8 August 2014.

A6.20 We then compare service charges with the different measures of cost, in particular DLRIC, DSAC and double FAC.[32] As discussed in Section 4, when carrying out this comparison we consider each service in aggregate (rather than considering individual connection and rental charges) over a customer lifetime of three years. We consider that three years represents a reasonable estimate of average contract duration, given the survey evidence obtained for the May 2015 BCMR Consultation and the feedback we have received from operators (see discussion of term products in Section 5).

A6.21 For a given service, our cost and charge estimates therefore consist of a single connection and three years of rental charges. For certain services, the rental charges can include a distance-based element. This includes main link charges for certain Ethernet services and distribution and regional trunk charges for PPCs and RBS services. We therefore need to make an assumption about what these distances are.

A6.22 For Ethernet services, BT's compliance spreadsheet for the current control includes the average main link length for different types of service. For the services that account for the majority of volumes and revenues, these range from around [✂] kilometres.[33] We therefore assume an average main link length of [✂] kilometres (though we note that changing this assumption by ±5 kilometres does not affect our overall results).

A6.23 For PPC and RBS services, we calculate the average distribution distance by dividing total distribution volumes by the total volume of links for each service; if a main link charge is not incurred then there will be no distribution charge either. We follow a similar approach to calculate the average regional trunk distance. Although not all customers purchasing a main link will incur a regional trunk charge (if BT Wholesale hands the circuit over in the same Trunk Aggregation Node (TAN) catchment area), we do not have information on the proportion of customers that incur such a charge. We therefore use all main links to calculate the average. However, we note that if we calculate PPC and RBS charges excluding any regional trunk, our overall results do not change.

A6.24 When each service in our Ethernet and TI baskets is considered in aggregate we do not find any to be priced above DSAC or double FAC. Some are priced below DLRIC but, in the case of Ethernet (EAD LA 10Mbit/s services), these are services with very few connections forecast in 2016/17 and the rental charges are above DLRIC. In the case of TI (2Mbit/s PPCs in the Central London Zone), as set out in Sections 4 and 7, we do not propose to make any starting charge adjustments to services that are priced below DLRIC.

Changes in cost attribution

A6.25 In Sections 6 and 7, we explain the adjustments that move costs between BCMR and unregulated markets that we consider should be included as a starting charge adjustment. These include:

- Access cards – removal of costs associated with Ethernet switches that are not used to provide CISBO services, but currently have costs attributed to them;

[32] As discussed in Section 4 we have chosen double FAC as a threshold based on regulatory judgement and taking into account BT's current rates of return on wholesale leased lines.
[33] BT response dated 25 March 2015 to question A2 of the 15th s135 notice dated 18 March 2015.

- changes in cost attribution by BT and the Cost Attribution Review project – reallocation of costs that are incremental to unregulated services based on identifying more appropriate cost drivers; and

- accounting errors – errors in accounting treatment that resulted in costs that are incremental to unregulated services being attributed to business connectivity services.

A6.26 As set out above, for both the Ethernet and TI baskets we produce two cost estimates: one that includes all base data adjustments and one that excludes the adjustments that move costs between BCMR and unregulated markets. We then calculate basket costs under the two scenarios and the percentage difference between the two represents our starting charge adjustment.

A6.27 To illustrate this, suppose that total basket revenues in 2016/17 were £100 million while unadjusted costs (i.e. including the costs that should be allocated to unregulated markets) were £80 million and fully adjusted costs (i.e. excluding the costs that should be allocated to unregulated markets) were £60 million. The latter represents our estimate of the basket FAC. As the adjustment results in a 25% reduction in costs (from £80 million to £60 million), we impose the same adjustment to revenues, reducing them from £100 million to £75 million.

A6.28 Applying this methodology for the Ethernet and TI baskets results in starting charge adjustments of -9% and -7.75% respectively. As we expect BT to implement this at the start of the next control (i.e. on 1 April 2016), we therefore need to adjust service charges when forecasting revenues in order to calculate the X.

A6.29 We set out in Sections 6 and 7 our proposals to give BT flexibility when implementing the starting charge adjustments, subject to the sub-baskets that we propose. We therefore do not know the magnitude of price reductions for each service at the beginning of the next control. In order to ensure that the adjustments are taken into account in our revenue forecasts, we assume that each charge in the Ethernet basket will be reduced by 9% and each charge in the TI basket will be reduced by 7.75% at the start of the next control. These charges are then assumed to be in effect throughout the rest of the control period and by multiplying the charges by the relevant volumes, this allows us forecast revenues in each year of the control.

Cost forecasting approach

A6.30 Cost forecasting models can take a number of different forms. When building cost models for setting charge controls, we have historically used one of two broad types of models, depending on the case in hand:

- Top-down model – based on the SMP operator's accounting data on its network component and service costs, which are mapped together on the basis of usage factors; or

- Bottom-up model – based on engineering models of how much network equipment is needed for a projected level of volumes for specified cost drivers.[34]

[34] On occasion hybrid models, based on bottom-up cost drivers and then calibrated against top-down cost data, have also been used.

A6.31 Consistent with previous LLCCs, we have built the 2015 LLCC Model using a top-down cost modelling approach based on cost data from BT's regulatory financial reporting systems. This approach is consistent with the approach adopted in the most recent WBA[35] and WLR/LLU[36] charge controls. We henceforth refer to this as our top-down modelling approach.

A6.32 The top-down modelling approach is an accounting approach that forecasts how BT's efficiently incurred costs will change over time relative to the base year.

A6.33 We forecast capital costs and operating costs separately and discuss each in turn below. We start by explaining the steps in generating our forecasts.

Our three-step forecasting approach

A6.34 The top-down modelling approach forecasts costs using the following three-step process:

Figure A6.2: Cost forecasting process

- **stage one** of the process is to establish the relevant costs in the base year[37] for the charge control. These base year costs are based on regulatory accounting data provided by BT. This regulatory accounting information is BT's view of its costs. As set out in Annex 7, we make a number of adjustments to this accounting data to reflect Ofcom's view of BT's efficiently incurred costs;

- **stage two** involves forecasting the various cost types based on volumes for the components remaining unchanged from the base year. This is referred to as the 'steady state' forecast. As is demonstrated further below, this stage is typically driven by forecast changes in asset values and assumed changes in forecast efficiency; and

- **stage three** then involves supplementing the steady state forecast to include the changes in costs associated with the forecast component/service volume changes (referred to as the 'additional costs' below). As demonstrated further below, the forecasts generated at this stage are driven by the forecast volume changes along with forecast changes in efficiency and the AVEs and CVEs.

A6.35 Under this approach, we sum together the steady state cost forecasts and the additional cost forecasts to produce a forecast of total costs with which we calculate the value of X for the TI and Ethernet baskets.

A6.36 BT's efficiently incurred costs include the costs it incurs for: i) acquiring assets that are used to provide its services (capital costs or capex); and ii) operating those assets and providing the services more generally (operating costs or opex). In the 2015 LLCC Model, we forecast capital costs and operating costs separately. We discuss each in turn below.

[35] Section 7, June 2014 WBA Statement.
[36] Volume 2, June 2014 FAMR Statement.
[37] In the case of the 2015 LLCC Model, the base year is 2013/14.

Forecasting of capital costs

A6.37 In this section, we first set out the terminology we use to discuss capital cost forecasting. Second, we provide details of the steady state and additional elements of our forecasting approach and explain how we have applied the approach in the 2015 LLCC Model. Third, we set out the forecasting equations we use in the 2015 LLCC Model.

A6.38 Table A6.1 explains the terminology used in this section.

Table A6.1: Explanation of accounting terms

Name	Description
Gross Replacement Cost (GRC)	The Current Cost Accounting (CCA) equivalent of Gross Book Value, i.e. the cost of BT replacing its assets with new ones now.
Net Replacement Cost (NRC)	The CCA equivalent of Net Book Value, i.e. depreciated replacement cost of BT's assets.
Operating capability maintenance (OCM)	A CCA convention, where the depreciation charge to the profit and loss account relates to the current replacement cost of the firm's assets, taking account of specific and general price inflation. As the name suggests, the OCM approach seeks to maintain the operating capability of the firm.
Financial Capital Maintenance (FCM)	An alternative approach to CCA in which an allowance is made within the capital costs for the holding gains or losses associated with changes over the year in the value of the assets held by the firm. In contrast to OCM, the FCM approach seeks to maintain the financial capital of the firm, and hence the firm's ability to continue financing its functions.
OCM depreciation (OCM dep)	The reduction in value (as measured by the GRC) of the assets over the course of the financial year associated with the reduction in the asset's remaining life.
Cumulative OCM depreciation (Cum OCM dep)	The sum of the individual in-year OCM depreciation over the asset life up to the year being forecast, adjusted to reflect any changes in asset values over time
Input price changes (IPC)	Changes in the prices of the underlying inputs to costs. This includes changes to assets prices and changes to operating costs.
Holding gains and losses (HGL)	The change in the value of the underlying assets used by the company over the course of the financial year
Disposals (Disp)	The assets that the firm disposes of (e.g. an asset that becomes fully depreciated or an asset that the firm sells) over the course of the financial year.
Capital expenditure (Capex)	The firm's level of investment in fixed assets over the course of the financial year.
Net Current Assets (NCA)	A measure of the amount of capital being used in day-to-day activities by the company. It is equal to the current assets less current liabilities.
Mean capital employed (MCE)	BT's definition of Mean Capital Employed is total assets less current liabilities, excluding corporate taxes and dividends payable, and provisions other than those for deferred taxation. The mean is computed from the start and end values for the period, except in the case of short-term investments and borrowings, where daily averages are used in their place.
Fully allocated costs (FAC)	An accounting approach under which all the costs of the firm are distributed between its various services.

Name	Description
Inflation	The general change in prices across the economy.
WACC	BT's weighted average cost of capital.
Return on capital employed (ROCE)	The ratio of accounting profit to capital employed. The measure of capital employed can be either HCA or CCA.

Top-down modelling approach to capital cost forecasting

A6.39 As set out in Section 5, we are proposing to use the CCA FAC cost standard for setting the 2016 LLCC.[38] We adopt the Financial Capital Maintenance (FCM) approach to CCA for establishing the allowed capital costs for BT.[39] The FCM approach, as set out in Table A6.1 above, seeks to maintain the financial capital of the firm, and hence the firm's ability to continue financing its functions. For modelling purposes, this involves including an allowance within the capital costs for the holding gains or losses associated with changes over the year in the value of the assets held by the firm, in addition to an allowance to undertake the capital expenditure (capex) required to retain the output capability of the firm's assets.

A6.40 Under the top-down modelling approach, we forecast steady state and additional capital costs separately. The purpose of steady state capex is to replace the assets that have come to the end of their life over the year, and therefore are disposed of, so that the firm can maintain its output capability in the steady state. Additional capex on the other hand is the investment in assets the firm makes to meet changes in demand.

A6.41 Under our typical top-down modelling approach, steady state and additional capex interact in the following way:

- both steady state and additional (positive and negative) capex are derived from the gross replacement value (GRC) of the firm's asset base. This implies that steady state and additional capex (be that positive or negative) all relate to new assets, i.e. assets that are yet to have depreciated in value;[40]
- when volumes increase, the firm increases the size of its asset base by investing in positive additional capex in addition to steady state capex; and
- when volumes decrease, the firm decreases the size of its asset base by means of a flow of negative additional capex in addition to steady state capex. For

[38] Subject to the RAV adjustment explained in Annex 7.
[39] As opposed to the OCM approach which is explained in Table A6.1.
[40] In the base year, BT's steady state capex is set equal to OCM depreciation (see row 5 of Table A6.1). OCM depreciation is a function of the gross replacement cost (GRC) of the firm's assets (see row 1 of Table A6.1). In subsequent years, steady state capex is derived from the previous year's steady state capex, taking into account input price changes and efficiency. GRC represents the value of a firm's assets before taking into account depreciation. Additional capex (both positive and negative) is derived from the firm's GRC in the previous year. Both steady state and additional capex are then used to calculate steady state and additional GRC respectively. Steady state and additional GRC are used to derive net replacement costs (NRC) (see row 2 of Table A6.1), and ultimately return on mean capital employed. NRC reflects the value of a firm's assets taking into account the effect of depreciation. Hence, by deriving NRC from capex that has been calculated on the basis of the previous year's GRC, the top-down modelling approach assumes that all capex, (steady state, positive additional and negative additional) relates to assets that are yet to have depreciated in value.

modelling purposes, negative additional capex is either where the firm forgoes investing steady state capex, or where it disposes some of its assets i.e. additional disposals:[41]

- in the case of the former, modest volume decreases result in positive steady state capex being offset against negative additional capex such that the resulting total capex (steady state + additional) is positive, or at the limit, 0; and

- in the case of the latter, greater volume decreases mean negative additional capex outweighs positive steady state capex, resulting in negative total capex. The value of negative total capex represents the forecast of additional disposals required to reduce the firm's asset base, in addition to the disposals that the firm makes in the steady state.

Application of our typical capital forecasting approach to Ethernet and TI services

A6.42 In markets where demand is stable and services are anticipated to be provided for the foreseeable future, the implementation of our typical top-down modelling approach is relatively straightforward.

A6.43 For example, in the case of Ethernet services we have forecast year-on-year increases in rental volumes of between 2013/14 and 2018/19. Our approach predicts that BT will invest in both steady state and positive additional capex for the purposes of supplying Ethernet services, such that new assets will be used both to replace assets that have come to the end of their lives and to meet the increases in demand.

A6.44 Similarly, in cases where volume declines are modest, the top-down modelling approach appears to forecast capital costs in a reasonable way. As both steady state and negative additional capex are valued on the same basis (the GRC value of the firm's asset base), offsetting steady state capex with some negative additional capex is equivalent to assuming that the firm can achieve a sufficient decrease in the size of its asset base by simply not replacing assets that reach the end of their lives, i.e. investing a lower amount of steady state capex (or at the limit, no steady state capex). We note that a lower amount of capex on new assets has the effect of increasing the average age of the firm's asset base over time, but do not consider this to be an unrealistic scenario in a declining market.

A6.45 On the other hand, where volume declines are so great that additional disposals are also required, as is the case for TI services, the application of our typical top-down approach may not necessarily realistically reflect the underlying changes in the asset base as a consequence of the volume changes. In particular, the change in the value of the asset base may not be the same where volumes are decreasing rapidly and the market is in terminal decline as when volumes are growing. Due to the fact that negative additional capex is derived from the firm's GRC, our typical top-down approach implicitly assumes that the firm would reduce its asset base solely by disposing of new assets. This treatment is symmetric with how the value of the asset base is assumed to grow when volumes increase. However, while it may be reasonable to assume that the firm invests in new assets to meet new demand, it seems unreasonable to assume that any disposals beyond deferring steady state disposals will also involve new assets; by definition such disposals

[41] For example, where the firm sells its assets on the secondary market or redeploys them within its business.

involve disposing of assets from within the existing asset base which will have been subject to some form of depreciation charge.

We have amended our typical treatment of capex to more appropriately forecast capital costs when volumes are in rapid decline

A6.46 Given the forecast rapid decline in demand for TI services, in particular, over the control period, and the potential limitations of our typical approach to forecasting capital costs in such circumstances (as set out above), we have considered whether adjustments to our typical capex forecasting equations are required for this control.

A6.47 In circumstances where volumes are in continuous decline and the end of production of the product or service is expected in the short to medium term, a firm in a competitive market would need to manage its asset base in order to have sufficient productive assets available to meet demand until it decides to cease production, but not too many as this would lead to productive inefficiency and, therefore, either losses and/or uncompetitive pricing.

A6.48 There is likely to be a broad range of possible asset portfolio mixes that the firm could adopt for managing its asset base until production ceases:

- the firm could operate a portfolio of relatively new assets of which a large proportion may therefore still have significant life, and therefore likely value, remaining when production ceases; or

- the firm could operate a portfolio of relatively older assets for which there would likely be fewer, if any, assets with life remaining when production ceases.

A6.49 The firm's choice of the asset age mix within its asset portfolio would normally affect the costs of production. Older assets are likely to require more maintenance expenditure (i.e. operating costs) to maintain their output capacity. Newer assets are likely to require less maintenance, but incur higher capital costs (e.g. return on capital employed) as newer assets usually have a higher value.[42] These impacts are typically related in well-functioning asset markets as the higher value of the newer assets reflects, at least in part, the lower operating costs. Where asset markets are well-functioning, we may expect the firm to be indifferent between operating a newer or older portfolio of assets. If the firm uses newer assets it will have higher capital costs and lower operating costs, but will need to dispose of the asset when production ceases to recover the residual value. If the firm uses older assets, it has higher operating costs but lower capital costs and a reduced requirement to dispose of the asset when production ceases.

A6.50 However, there may be reasons why the firm is not indifferent between the options and therefore would need to establish the profit maximising mix of asset age. The rational profit maximising firm would need to adopt an asset mix that minimises its costs of production by balancing the costs of acquiring, maintaining, financing and disposing of its assets. Relevant factors to this decision may include:

[42] Specifically, higher capital costs would likely result from the values of (i) the return on capital, as NRC should reflect the value of the assets in alternative uses (i.e. newer assets have a higher value than older assets); and (ii) depreciation charges, as the firm is likely to set depreciation profiles to allow it to recover the costs associated with the investments taking into account any (net) redeployment or disposal revenues at the end of production.

- **asset values may not accurately reflect maintenance costs**: although we would expect firms to be broadly indifferent between operating an older or newer portfolio of assets where asset markets are well-functioning, in practice asset values could over or under reflect maintenance costs. In such cases an optimal balance between the maintenance and capital costs may need to be struck;

- **costs of disposal/redeployment**: firms may incur costs associated with disposing of, or redeploying, assets which will form part of the firm's profit maximising portfolio mix decision. Higher costs of disposal/redeployment are likely, all else being equal, to lead a profit maximising firm to adopt an older asset base;

- **risk of unexpected holding losses**: if the firm chooses to operate a relatively young mix of assets, there is likely to be a greater emphasis on disposing of those assets at the end of production. The value of the asset at any point in time will reflect an expectation of the potential other productive uses for that asset in the future. In a competitive market, the firm will price on the basis of this valuation. If this valuation turns out to be incorrect, the firm will experience unexpected holding gains (if the asset values are higher than expected) or losses (if the asset values are lower than expected) that would not necessarily be reflected in prices. Therefore, operating a relatively younger portfolio of assets is likely to introduce greater risks of cost recovery for the firm than an older portfolio of assets. We might expect a risk-averse firm to maintain an older portfolio of assets for this reason; and

- **penalties associated with poor service** – even with enhanced maintenance, it may be reasonable to assume that older assets may be more prone to failures which could disrupt customer services. If service quality failures are associated with significant commercial implications, either through demand effects or through penalty payments, we would expect such risks to typically form part of the firm's decision over its asset age mix. We would expect such risks to point towards a younger portfolio of assets.

A6.51 As is clear from above, some of these factors point to the optimal average asset age being lower, while others point to it being higher. Quantifying these various considerations in the context of the LLCC is difficult and impractical for the purposes of the 2016 LLCC. For the purposes of setting the charge control, we therefore propose a simplified, pragmatic approach in which we adopt the following assumptions:

- if the requirement for productive assets declines over time, i.e. volumes are reducing year-on-year, then we assume that BT manages the declining asset demand in the first instance by not investing in steady state capex. This is consistent with our typical top-down approach; and

- however, where the decline in demand for assets is so large that the decline cannot be met through forgoing steady state capex, we assume that BT will make additional disposals of averagely aged assets. The average age of BT's assets is derived from NRC:GRC ratios.[43] Table A6.3 below sets out the specific equation we use to calculate additional disposals.

[43] Due to circularity considerations, in practice we use the prior year NRC:GRC ratio.

A6.52 We consider that this approach strikes an appropriate balance between the potentially competing considerations. We also note that the model outputs resulting from this approach appear reasonable given the market circumstances.

2015 LLCC Model capital cost equations

A6.53 Table A6.2 below sets out the abbreviations used in the cost forecasting equations.

Table A6.2: Abbreviations used in cost forecasts

Abbreviation	Description
SS	Steady state
Add	Additional
Total [x]	Steady state [x] + Additional [x]
CVE/AVE	Cost-volume elasticity or Asset-volume elasticity
eff	Efficiency change percentage
Pay(t)	Pay operating costs in time period t
Non-pay(t)	Non-pay operating costs in time period t

A6.54 Table A6.3 below presents the steady state and additional capital cost equations used in the 2015 LLCC Model.

A6.55 As Table A6.3 shows, steady state costs are primarily driven by asset lives, forecast changes in input price and assumed improvements in efficiency, while additional costs are primarily driven by volume changes and the asset-volume and cost-volume elasticities, as well as input price changes and efficiency improvements.

Table A6.3: Approach to forecasting steady state capital costs

Cost	Steady state (SS)[44]	Additional (Add)
GRC	SS GRC(t) = SS GRC(t-1) * [1 + IPC(t)] + SS Capex(t) – SS Disp(t)	Add GRC(t) = Add GRC(t-1) * [1 + IPC(t)] + Add Capex(t)
OCM dep	We assume straight line depreciation, and calculate as: SS OCM dep(t) = SS GRC(t) / asset life Where asset life is equal to the ratio GRC/OCM dep in the base year.	Add OCM dep(t) = Add GRC(t)/asset life
Cum OCM dep		Add Cum OCM dep(t) = Add Cum OCM dep(t-1) * [1 + IPC(t)] + Add OCM dep(t)
Capex	Base year capital expenditure is assumed to be equal to OCM dep. Subsequent years are calculated as: SS Capex(t) = SS Capex(t-1) * [1 + IPC(t)] * (1 – eff)	It is assumed Add Capex is required where: SS Capex(t) + Add Capex ≥ 0. Add Capex(t) = total GRC(t-1) * [1+IPC(t)] * AVE * %change vol(t) * (1 – eff)
Disp	Base year disposals are assumed to be equal to OCM dep. Subsequent years are calculated as: SS Disp(t) = SS Disp(t-1) * [1 + IPC(t)]	It is assumed Add disposals are required where: SS Capex(t) + Add Capex <0, Add Disp(t) = ([SS Capex(t) + Add Capex] * NRC/GRC(t-1)) - SS Capex(t)
NRC	SS NRC(t) = SS NRC(t-1) * [1 + IPC (t)] + SS Capex (t) – SS OCM dep (t)	Add NRC(t) = Add GRC(t) – Add Cum OCM dep(t)
NCA	NCA(t) = NCA(t-1) * [1+ volume change %] * [1 + Inflation]	
HGL	HGL(t) = -SS NRC(t-1) * IPC(t)	Add HGL(t) = -Add NRC(t-1) * IPC(t)
Return on capital	Return on capital (t) = [NRC(t) + NCA(t)] * pre-tax nominal WACC	

A6.56 As mentioned above, we have forecast the total capital cost as the sum of the steady state and additional elements for each cost category set out in Table A6.3 above.

Forecasting of operating costs

A6.57 Table A6.4 below presents the equations used in the 2015 LLCC Model to forecast operating costs. Under our approach, operating cost forecasts are driven by forecast volume changes and CVEs, in addition to forecast changes in input price changes and assumed improvements in efficiency.

[44] Base year values of GRC, OCM dep, NRC, NCA and HGL are taken from BT's responses to s135 information requests and include the Ofcom base year adjustments set out in Annex 7. Subsequent years are forecast using the equations set out in Table A6.3.

Table A6.4: Approach to forecasting operating costs

Calculation	Description[45]
Pay	Pay(t) = Pay(t-1) * [1 – eff] * [1 + IPC(t)] * [1 + %volume change(t) * CVE]
Non-pay	Non-pay(t) = Non-pay(t-1) * [1 – eff] * [1 + IPC(t)] * [1 + volume change %(t)* CVE]

A6.58 Annex 8 provides details on the CVEs and forecasts of volumes, efficiency and input price changes used to forecast operating costs.

Network component costs and administrative and other costs

A6.59 We obtained base year cost data from BT disaggregated to the service and component levels. We also obtained from BT matrices of usage factors that allow us to convert component level costs into service level costs. BT's regulatory costing systems record two distinct types of costs:

- network component costs – the calculation of the cost of service provision represents the utilisation of one or more network components which have measurable cost drivers in the form of cost usage factors. Such costs are therefore determined by an attribution of component costs;[46] and
- administrative and other costs (admin) – the calculation of the cost of service provision represents a top-down allocation, for example, on a pro-rata basis using full-time equivalents (FTEs). As such, BT has not identified cost drivers for such costs and the cost usage factors reported in the RFS represent the percentages of admin component costs that have been attributed to services.[47]

A6.60 For network component costs, we forecast costs on a component-by-component basis using the equations set out in Tables A6.3 and A6.4 above. The inputs and assumptions used for these calculations (e.g. volumes, input price changes and CVEs and AVEs) are therefore also on a component-by-component basis. In order to calculate component volumes, we applied volume usage factors to our forecast of service volumes. Usage factors are therefore an important input to our cost modelling. Below provide details on the usage factors used in the modelling.

A6.61 For admin costs, we forecast costs on a service-by-service basis as it is not possible to convert component level costs to service level costs using usage factors. In order to forecast these costs, we have taken the base year allocations of admin components to services provided by BT and have applied the equations set out in Tables A6.3 and A6.4 above. As some of the forecasting inputs we use have been provided by BT on a component-by-component basis (e.g. AVEs and CVEs, input price changes), we have converted them to the service level by weighting component level data by the relevant service costs. For example, we have calculated service pay operating cost CVEs by weighting component pay CVEs by base year service pay operating costs.

[45] Base year values of Pay and Non-pay operating costs are taken from BT's responses to s135 information requests and include the Ofcom base year adjustments set out in Annex 7. Subsequent years are forecast using the equations set out in Table A6.4.
[46] BT, DAM, p. 206.
[47] For example, see SG&A partial private circuits in Appendix 1.1, page 128 and explanation of footnote (a) on page 147 of BT's 2013/14 RFS.

Calculation of total service cost forecasts

A6.62 In order to calculate cost forecasts for baskets of services, it is first necessary to convert the forecasts of network component costs into service costs. We do this by carrying out the following steps:

- Unit component costs(t) = component costs(t) / component volumes(t);
- Unit service *a* costs(t) = matrix multiplication of unit component costs(t) and cost usage factors by service *a* for each of the components; and
- Service *a* costs(t) = unit service *a* costs(t) * service *a* volumes(t).

A6.63 We then calculate forecasts of total service costs by summing the service cost forecasts of these network component costs and the service-level admin costs described above.

Dark fibre cost uplift

A6.64 As set out in Section 6, we propose to uplift Ethernet basket costs in the final year of the control to reflect the lost contribution from cannibalised active circuits as a result of migration to dark fibre products. Below we explain how we have calculated the FAC contribution from dark fibre and our detailed calculation of this uplift, which reflects differences in forecasts of fixed and common costs and variable passive component costs between EAD 1Gbit/s (upon which the dark fibre price is based) and above 1Gbit/s services that are forecast to migrate to dark fibre. We calculate the total shortfall to be about £4.6m which is the amount of costs that we add to the final year.

A6.65 In addition, BT is likely to incur a range of implementation and development costs associated with the introduction of dark fibre products. For example, BT is likely to have to make changes to its internal systems (e.g. planning and build systems, billing systems) and incur additional operational and training and spend. We have calculated that BT will incur approximately [✂] [£5m to £10m] in dark fibre development costs in the final year of the charge control, which we propose to include in the Ethernet basket.

A6.66 We have uplifted the Ethernet basket cost stack in the final year of the control to ensure that BT can fully recover its efficiently incurred costs in light of both of these factors. We have calculated the passives uplift to be approximately [✂] in total, or about [✂] of Ethernet basket costs.

Calculating the value of X

A6.67 Having selected the appropriate services to include in the charge control baskets, the model calculates total basket costs and total basket revenues (absent a charge control):

- Total basket costs(t) = Sum of individual service costs(t); and
- Total basket revenues(t) in the absence of a charge control = Prices(0) * Service volumes(t) , where Price(0) is the start charge for each service.

A6.68 To determine the value of X for each basket, the model compares the total costs and revenues, expressed in real terms (2015/16 prices), in the final year of the charge control.

A6.69 The start charges used to forecast revenues are the service prices in 2015/16, adjusted to take into account the start charge adjustments outlined above. In effect, we forecast revenues in the absence of a charge control.

A6.70 The model forecasts costs on a nominal basis. In order to ensure costs are expressed on the same basis as revenues (i.e. 2015/16 prices), we have applied a forecast CPI deflator to forecast costs, using 2015/16 as the base year. We have used the average of independent forecasts of CPI compiled by HM Treasury.[48]

A6.71 We calculate the value of X as follows:

$$X = ((Costs_T / [Price_0 * Volumes_T])^{1/3} - 1) * (1 + Inflation_{Avg})$$

Where:

$Costs_T$ = Forecast costs at the end of the charge control (2018/19)

$Price_0$ = Service prices at the start of the charge control (2015/16)

$Volumes_T$ = Service volumes at the end of the charge control.

$Inflation_{Avg}$ = Geometric average of forecast inflation during the charge control period[49]

A6.72 The term "* (1 + $Inflation_{Avg}$)" is applied when calculating the value of X to enable the resulting X value to be applied to prices as a CPI-X price cap.[50]

A6.73 Finally, we round the calculated values of X to the nearest 0.25%, consistent with the approach adopted in the March 2013 BCMR Statement.

Detailed modelling issues

A6.74 In this section, we discuss below how we have approached a number of detailed modelling issues concerning the following:

- level of aggregation used in the model;
- calculation of usage factors;
- modelling of revenues;
- implementation of MEA approach;
- geographic cost adjustments; and

[48] HM Treasury, *Forecasts for the UK economy*, May 2015, Page 19, https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/428467/Forecasts_for_UK_economy_May_2015.pdf)

[49] The value of CPI forecast for each of these years is 1.8%, 1.9% and 2.0%, giving a (geometric) average of 1.9% over the period.

[50] It makes use of the Fisher Equation.

- passives modelling

Level of aggregation used in the model

A6.75 In the 2013/14 RFS, BT reports the costs of regulated leased lines on what it refers to as a service level (see annex 11 of the 2013/14 RFS) and a component level (see annex 17 of the 2013/14 RFS).[51] Both of these measures have been subject to a degree of aggregation by BT. In building the 2015 LLCC Model, we considered the appropriate level of aggregation to use.

A6.76 The components reported in the RFS are in fact super-components, which are made up of more detailed components. For example, the 'Wholesale & LAN extension services fibre etc.' (CO450) super-component is made up of twelve components that include 'Ethernet Access Direct fibre' (CW609), 'OR systems & development – Ethernet' (CO772) and 'Other Ethernet rentals – internal' (CW617). The CO450 super-component unit cost reported in Annex 15 of the RFS is therefore a weighted average of the unit costs of its constituent components.

A6.77 Our general view is that the use of more disaggregated input data is likely to provide more accurate forecasts of costs. In this case, if the relative weights of the components that make up a super-component were to change over the forecasting period,[52] the base year super-component unit costs implied by the usage factors may not be representative of super-component unit costs in subsequent years. As a result, we gathered cost and usage factor data from BT on a cost component basis (rather than on a super-component basis). As set out above, we forecast network component costs on a component basis in the model.

A6.78 Similarly, the services reported in the RFS are in fact groupings of more disaggregated service variants sold by BT. For example, the WES 100Mbit/s rentals services BT reports are made up of standard WES 100Mbit/s rentals, WES Local Access 100Mbit/s rentals and WES Aggregation 100Mbit/s rentals. While BT records volume and pricing data on the basis of individual service, we understand that it is not possible for BT to provide cost and usage factor data to the same level of disaggregation.[53] As a result, in the model we have forecast costs at the service group level, which implicitly assumes the mix of service variants within service groups will remain constant over the forecasting period. In order to ensure that revenues are forecast on the same basis as costs, we have aggregated the volume and pricing data to the service group level. Below we provide details of our approach to modelling revenues.

A6.79 In summary, we have attempted to model at the most disaggregated level possible. Consequently, the 2015 LLCC Model forecasts costs and revenues at the level of components and service groups.

Calculation of usage factors

A6.80 We received base year data from BT in the form of service level costs, split by component. We also gathered from BT matrices of usage factors that describe how much component costs/volumes are used to provide TI and Ethernet services. As

[51] Annexes 11 and 17 to section 8 "Review of Business Connectivity Markets" in BT's 2013/14 RFS.
[52] For example, due to a change in the volume mix of services using the various components.
[53] This is because BT's regulatory cost system, ASPIRE, uses broadly the same level of service disaggregation reported in the RFS.

the 2015 LLCC Model forecasts costs on the basis of both components and services, we rely on usage factors to accurately:

- convert (network) component level costs to service level costs and vice-versa; and
- convert service volumes to component volumes and vice-versa.

A6.81 In order to check usage factors BT submitted for TI and Ethernet services, we calculated usage factors from the base year cost data BT provided. To do this, we built a matrix of unit costs split by components and services and divided the unit cost of each component-to-service combination by the relevant total component unit cost. We found that the results of this calculation reconciled with the cost usage factors submitted by BT and were consistent with the usage factors that can be derived from annex 16 of the 2013/14 RFS. As an additional check, we used the calculated cost usage factors to convert base year component level costs to service level costs using the approach set out in paragraph A6.62.[54] We found that the total level of service costs post-conversion equalled the total level of component costs pre-conversion.

A6.82 As set out in Annex 7, BT identified a number of issues with the base year cost data relating to TI services that it initially provided. We understand that BT rectified certain issues by adjusting the cost usage factors for TI services. As a result, rather than use the cost usage factors BT provided, the 2015 LLCC Model uses cost usage factors we have calculated on the basis of the revised base year cost data.

A6.83 In order to check the accuracy of the volume usage factors, we calculated component volumes by summing the product of the volumes of each service and the relevant component-to-service volume usage factors. We checked that the results of this calculation were consistent with the super-component volumes reported in Annex 15 of the 2013/14 RFS.

Modelling of revenues

Service aggregation

A6.84 As we implement a top-down model, we forecast costs and revenues for the leased line services that are reported in BT's regulatory accounts. In some cases, these reported services (or service groups) aggregate a number of individual services which sometimes have different charges. For example, the regulatory reports for external EBD 1000Mbit/s rentals outside the WECLA include both the standard and extended reach products for three different bands (A, B and C). Although each of these has a different charge, our model requires a single charge in order to ensure that service revenues are consistent with costs.[55]

A6.85 In order to calculate a single charge for a service group that encompasses several charges, we calculate a charge that is weighted by the volumes reported in the 2013/14 financial year (which is our base year). For example, if a reported service includes two charges (£500 for A and £1,000 for B) and the relevant 2013/14

[54] (i) Unit component costs(t) = component costs(t) / component volumes(t); (ii) Unit service a costs(t) = matrix multiplication of unit component costs(t) and cost usage factors by service a for each of the components; and (iii) Service a costs(t) = unit service a costs(t) * service volumes(t)

[55] As BT does not report costs at the disaggregated level (e.g. it does not report costs separately for different EBD bands), we cannot model service costs on this basis.

volumes were 100 for A and 50 for B, then the weighted average charge would be £666.67.[56] As we use charges at the end of the current control period as our starting point to determine charges for the entire duration of the next control, this means that we are implicitly assuming that within a service group the relative proportions of different variants are constant over time.

A6.86 Although this represents a simplification, it is consistent with our cost forecasts, which also assume the same mix over time.[57] Furthermore, in the majority of cases where a reported service group includes several charges, there is usually one particular charge that accounts for the majority of 2013/14 volumes; for example in the case of EBD rentals outside the WECLA, the standard band A variant accounted for around 80% of volumes in 2013/14.[58]

Ethernet Service Charges

2015/16 charges

A6.87 As discussed above, for the current consultation our starting point for determining charges during the control period is to use the charges that were in effect on 1 April 2015 (i.e. at the start of the final year of the current control). However, the price changes that BT implemented on this date are not sufficient to comply with the existing control. Openreach is therefore expected to make further reductions later in the year.

A6.88 If we used the charges that were in effect on 1 April 2015 in our model, without any adjustment, we would overstate revenues during the control period, and therefore set an X that would likely bring charges to a level lower than cost. For the purposes of this consultation, we therefore consider it appropriate to make an adjustment to BT's charges to ensure that we do not overstate revenues during the control.[59]

A6.89 We requested Openreach's most recent version of its compliance spreadsheet for Ethernet services outside the WECLA.[60] This showed that, based on prior period revenues, Openreach needed to make price reductions worth around [✂] in total. This equates to an average reduction of around [✂] for all service charges in the current basket.

A6.90 In practice, Openreach may not apply the same reduction to all charges. For example, it might focus reductions to a particular product or product group. We requested information from Openreach as to whether it had plans to reduce prices of specific products. [✂].[61]

A6.91 Therefore, in the absence of further information, we have taken the charges that were in effect on 1 April 2015 and applied a uniform [✂] reduction to all services in the current charge control basket.

[56] As A accounted for two-thirds of volumes, the weighted charge is £500*0.67+£1000*0.33=£666.67.
[57] It is not possible to forecast costs assuming a different mix for a service group because we do not have the information to calculate how the relevant component usage factors would change.
[58] BT response dated 16 January 2015 to question C1 of the 8th s135 notice dated 12 January 2015.
[59] We note that this adjustment may not be necessary for the final 2016 BCMR Statement if BT implements all of its planned price reductions by autumn 2015.
[60] BT response dated 25 March 2015 to question A2 of the 15th s135 notice dated 18 March 2015.
[61] BT response dated 20 March 2015 to question A1 of the 15th s135 notice dated 18 March 2015.

ECC Connection Charge

A6.92 As discussed in Section 9, in May 2014 we implemented a Direction that allowed Openreach to exempt new provisions of EAD services from the first £2,800 of ECCs and to make up the resulting loss of its revenue with a balancing charge of £548 on new EAD connections. For the purposes of assessing compliance with the 2013 LLCC, the Direction allowed BT to exclude £548 from its published price list for EAD connections. As we propose to continue controlling ECC charges and the balancing charge outside of the Ethernet basket, we have excluded the £548 charge from all EAD connections in our model.

Discounts

A6.93 As set out in Section 5, Openreach currently offers 5 and 7 year term discounts on certain EAD products. As we do not propose to include discounts in our starting charges, we have used charges that exclude discounts. This assumes that the charges for a 5 or 7 year term product are the same as the equivalent 1 year standard products. Given that the magnitude of Openreach's current discounts are relatively small (as discussed in Section 5), the decision to exclude discounts does not have a material impact on the overall level of charges.

TI Service Charges

RBS, SiteConnect and NetStream charges

A6.94 Although we forecast the costs and volumes of different elements of RBS, SiteConnect and NetStream (i.e. for local ends, links, distribution and regional trunk) BT Wholesale's rental charges are simplified so that there is a simple charge based on bandwidth and distance. In order to calculate charges for these services, BT Wholesale calculates total revenues and divides this by circuit volumes; the charges are then reported against the local end services.[62] We therefore apply the overall charge for RBS, SiteConnect and NetStream services against the local end. Although this means that revenues do not match costs for each individual service (i.e. revenues will be overstated for local ends and understated for links, distribution and trunk), they will match in aggregate.

Enhanced Maintenance

A6.95 PPC customers have the option to pay additional charges for enhanced maintenance. These charges are published on the BT Wholesale Carrier Price list and are raised on a per circuit basis. BT's regulatory accounts make an allocation each year to match revenue from enhanced maintenance with the local end and main link services published in the RFS.[63] We have therefore used this information to apply an uplift to PPC charges where enhanced maintenance revenues have been allocated. For example, if the enhanced maintenance charge for an internal 2Mbit/s PPC local end was £200 and the 2013/14 regulatory accounts include a 50% allocation of enhanced maintenance charges to this service, we add £100 (£200*50%) to the standard local end charge.

[62] BT response dated 26 September 2014 to question A1 of the 1st s135 notice dated 7 August 2014
[63] BT response dated 4 March 2015 to question A2 of the 13th s135 notice dated 26 February 2015.

Services without charges

A6.96 There are some services in our model where we (and BT) are unable to map a relevant charge from BT Wholesale's price list. These accounted for around 3% of low bandwidth TI revenues in 2013/14.[64] The majority of these relate to separation and diversity, where BT captures certain revenues that are not included in the protected path service groups, and third party equipment services.[65] Given that we cannot use a charge in BT Wholesale's price list, we instead use average revenues based on 2013/14 data.

Implementation of MEA approach

A6.97 As discussed in Section 6, we have proposed adopting a MEA approach for the purposes of modelling the costs of legacy WES and BES services up to and including 1Gbit/s. We have modelled the costs of these services using the costs of what we consider to be the modern equivalent, following a similar modelling methodology and product mapping to what was used in the 2013 LLCC.[66] We note that this mapping is independent of the actual decisions that customers may make when transitioning from legacy to new services and whether they take the opportunity to upgrade their bandwidth at the same time.

A6.98 Table A6.5 below shows the mapping rules we have adopted for the purposes of forecasting the costs of providing WES and BES services up to and including 1Gbit/s. For example, the cost of a WES 10Mbit/s service has been set with reference to an EAD 10Mbit/s service. We do not make the MEA assumption for the above 1Gbit/s WES and BES services, as we have not identified a different MEA for these services.

Table A6.5: Mapping of services between legacy and newer Ethernet services

Legacy service	MEA equivalent
WES 10Mbit/s	EAD 10Mbit/s
WES 100Mbit/s	EAD 100Mbit/s
WES Other	EAD 100Mbit/s
WES 1Gbit/s	EAD 1Gbit/s
BES Other	EAD 100Mbit/s
BES 1Gbit/s	EAD 1Gbit/s

A6.99 Having applied this mapping, we carry out the following steps to forecast costs under the MEA assumption within the 2015 LLCC Model:

[64] BT response dated 25 March 2015 to question B1 of the 13th s135 notice dated 26 February 2015; BT response dated 15 May 2015 to questions F2-F4 of the 19th s135 notice dated 11 May 2015.
[65] Email dated 24 April 2015 from [✂] (BT) to [✂] (Ofcom), entitled 'RE: POH meeting notes and housekeeping issues', subsequently confirmed in BT's response dated 15 May 2015 to questions F2-F4 of the 19th s135 notice dated 11 May 2015.
[66] Paragraphs A12.62-A12.66, March 2013 BCMR Statement.

- we produce two service volume forecasts: (A) without MEA mapping, and (B) with MEA mapping;
- we apply volume usage factors to service volume forecasts (A) to generate component volume forecasts;
- we forecast total network component costs using the component volume forecasts on the basis of the forecasting equation set out in Tables A6.3 and A6.4, and calculate unit network component costs by dividing by the component volumes;
- these are converted into unit service costs by applying cost usage factors; and
- we calculate the forecast of total service costs by multiplying the unit costs by service volume forecast (B) (i.e. volume forecasts with MEA mapping applied).

A6.100 In short, the 2015 LLCC Model forecasts component costs assuming there is no MEA assumption. Service volume forecasts which include the MEA assumption are then applied to service unit costs once costs have already been forecast on a component basis. This ensures that the model produces realistic forecasts of component costs, i.e. that the forecasts do not reflect economies/diseconomies of scale that are purely the result of the mapping of legacy Ethernet services to the MEA services. This is consistent with the approach adopted in the March 2013 BCMR Statement.

Geographic cost adjustments

London Periphery

A6.101 In the March 2013 BCMR Statement, we defined a separate geographic market for low bandwidth AISBO services and MISBO services supplied to customers in the WECLA. We found that BT did not have SMP in the provision of MISBO services in the WECLA, while for low bandwidth AISBO services we found SMP and imposed a safeguard cap of CPI-CPI. As a result, our Ethernet charge control did not apply to services within the WECLA.[67] The current charge control basket for Ethernet therefore includes all Ethernet services outside the WECLA and BT's regulatory accounts report separate revenues and costs for Ethernet services in and outside the WECLA. As we have designed a top-down model, this means that our cost and revenue forecasts for individual services are also distinguished geographically, based on whether they are in or outside the WECLA.

A6.102 In the May 2015 BCMR Consultation, we have proposed four geographic markets (the CLA, London Periphery and the UK excluding these two areas and the Hull area) for CISBO services. We have proposed that BT does not have SMP in the provision of these services in the CLA and the Hull area and that it has SMP in the other two geographic markets. Our proposed charge control remedy for Ethernet services therefore applies to the London Periphery (LP) and the rest of the UK, excluding Hull. We have also proposed to define additional BT exchanges and data centres as core network nodes within the CI market.[68]

[67] Section 21, March 2013 BCMR Statement.
[68] Section 4, May 2015 BCMR Consultation.

A6.103 As the scope of our charge control includes the LP, which is part of the geographic market currently defined as WECLA, we need to ensure that services in this area are captured in our charge control model.

A6.104 In terms of adjusting the model to include services in the LP, we have analysed the circuit data inventory that BT submitted as part of the BCMR, which includes details of all Openreach Ethernet circuits as of March 2014, including the geographic location (postcode) of each circuit-end.[69] We have used this data to identify the proportion of circuits in the WECLA that are in the CLA and the LP. We have done so according to the implementation of the current remedy, which is as follows:

- wholesale end to end services (i.e. circuits between two end-user sites) – should be classified as inside the WECLA only if both end-users sites are in the WECLA and other circuits should be classified as outside the WECLA (i.e. if one or more sites are outside the WECLA); and

- other circuits (i.e. circuits between an end-user site and a network node or between network nodes) – should be classified as being in the WECLA if the end user site is within the WECLA or in the case of backhaul circuits if the remote end of a backhaul circuit is within the WECLA.[70]

A6.105 We have therefore categorised WECLA circuits as being in the CLA as follows (this approach is consistent with our proposal to categorise circuits in the CLA as set out in the May 2015 BCMR Consultation[71]):

- end-to-end services between two end-user sites are classified as being in the CLA only if both ends are in the CLA;

- circuits between an end-user site and a network node are classified as being in the CLA if the customer site is in the CLA;

- circuits between two network nodes – in this case we do not know which is the remote end so we cannot identify whether it should be in the CLA. Given that the CLA includes a larger number of network and core nodes, we assume that these circuits are in the CLA. In practice, the number of circuits between two network nodes that have one end in the LP and one in the CLA is small (around 1 per cent of circuits in the WECLA) so this assumption does not make a material difference.

A6.106 All WECLA circuits that are not classified as being in the CLA are assumed to be in the LP. Having categorised these circuits accordingly, we can then estimate the proportion of different circuit types (e.g. EAD 100Mbit/s, EAD LA 1000Mbit/s, etc.) in the WECLA that are in the LP. Our estimates for circuits with material volumes range from 20 to 30%. We then use this information to reallocate a proportion of WECLA volumes in our model to the geographic area outside the CLA. For example, if 10% of EAD10Mbit/s volumes in the WECLA are in the LP, then in our model we reallocate 10% of EAD 10Mbit/s rentals in the WECLA service code to the EAD10Mbit/s service code outside the WECLA.[72] We apply this reallocation to

[69] BT response dated 17 April 2014 to question A1 of the 1st BCMR s135 notice dated 7 March 2014.
[70] Paragraph 12.256, March 2013 BCMR Statement.
[71] Paragraph 10.88, May BCMR Consultation.
[72] We use proportions rather than the absolute volumes because the circuit data we received in the BCMR does not fully reconcile with the volumes in BT's 2013/14 regulatory accounts. This is partly due to differences in timing (between when data was gathered for the May 2015 BCMR Consultation and when it would have been gathered

both our base year volumes and our volume forecasts (i.e. in each year of the control).

A6.107 The BCMR circuit data does not distinguish between internal and external sales and it only includes rentals. We therefore apply the same proportions for internal and external rentals and connections; for example, if 10% of EAD 10Mbit/s volumes in the WECLA are in the LP, then we apply a 10% reallocation to internal and external EAD10Mbit/s rentals and connections.

A6.108 Although we consider these adjustments to be appropriate for the purposes of this consultation, before the final 2016 BCMR Statement we will engage with BT to refine our estimates in order to gain a more accurate estimate of the proportion of WECLA circuits that are in the LP.

A6.109 We note that by reallocating LP circuits to service codes outside the WECLA, we are assuming that the unit costs of LP circuits are the same as non-WECLA circuits. This is partly due to practicality issues, as assuming LP circuits have lower unit costs than other UK circuits would introduce further complexity in the model. However, we also consider that it is reasonable based on the analysis carried out in the May 2015 BCMR Consultation. In particular, we would expect leased line costs to be lower in dense urban areas. The May 2015 BCMR Consultation found that there were significant differences between the CLA and LP, with higher network reach, much greater business density and smaller postcodes.[73] It is therefore likely that unit costs are lower in the CLA compared to other areas in the UK, meaning that it is more appropriate to estimate costs in the LP using non-CLA costs.[74]

CI Core

A6.110 In the May 2015 BCMR Consultation, we proposed to include 96 additional BT exchanges and 60 data centres as CI core nodes.[75] These have been defined either as part of an existing TAN or as a new TAN. Circuits sold between Openreach Handover Points (OHPs) that belong to different TANs are classified as part of the competitive core network. Therefore, any circuits that are classified as 'core' by the May 2015 BCMR Consultation's proposed changes will no longer be part of an SMP market and subject to regulatory remedies (including a charge control).

A6.111 In order to reflect this in the charge control, we have used the BCMR circuit data to identify the proportion of circuits outside the CLA that are considered 'core' under the May 2015 BCMR Consultation's proposals (but were not previously). Our analysis indicates that the proportion of volumes affected is small; only 0-1% of most circuit types would be classified as 'core'. However, in order to ensure our control is consistent with our proposals, we have removed these volumes from our forecasts.[76]

---

for the RFS) and partly because our analysis of the BCMR circuit data drops circuits without complete postcode information.

[73] Section 4 and Annex 15, May 2015 BCMR Consultation.

[74] We also note that our unit cost estimates in the rest of the UK include leased lines in other Central Business Districts.

[75] CI Core represents the core conveyance market, which encompasses high capacity infrastructure between major urban locations and network hubs

[76] Though we include them when calculating component costs as they remain relevant to the costs of charge controlled circuits, due to economies of scale and scope.

Passives modelling

A6.112 As set out above, we are proposing two uplifts to the forecast costs for the Ethernet basket as a consequence of our proposed dark fibre remedy, to reflect both the cannibalisation of active circuits by dark fibre and the development and implementation costs associated with the dark fibre remedy itself. We now set out our basis for each of these uplifts.

Calculation of the uplift to Ethernet basket costs – to reflect the lost contribution from cannibalised active circuits

A6.113 As set out in Section 6, we are concerned that BT's opportunity to recover its efficiently incurred costs could be undermined as a result of the cannibalisation of active circuits by the proposed dark fibre remedy. As we explain below, this includes the impact of dark fibre on the cost recovery for CISBO circuits outside of our charge control basket.

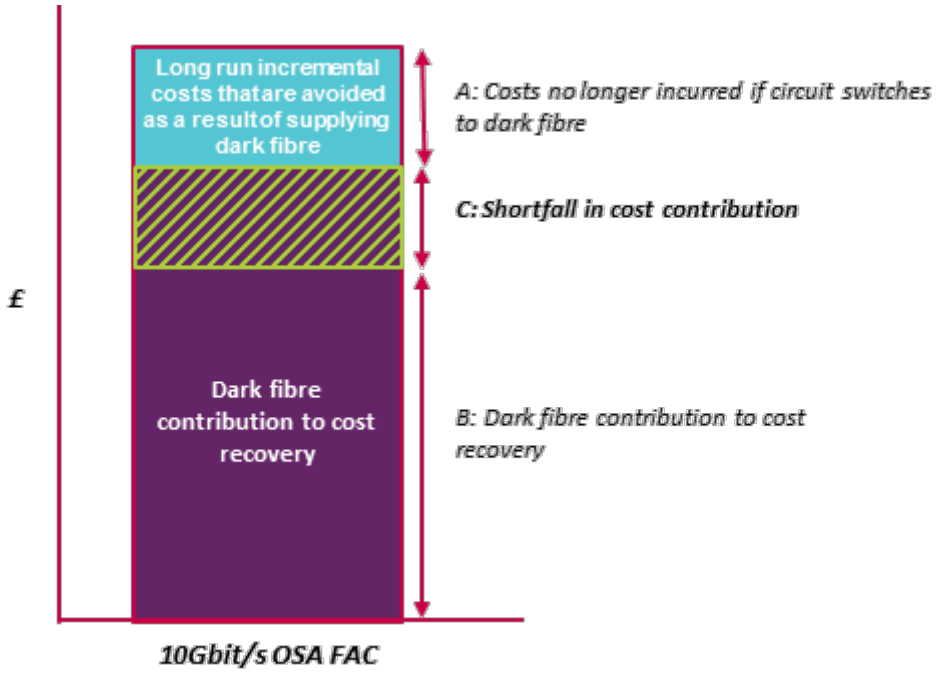
A6.114 When we set charge controls, we seek to set revenues so that they equal forecast costs (in this case FAC) for the charge control baskets by the end of the control period.[77] Implicitly, we assume that, on average, BT is also able to recover the FAC of non-charge controlled services such that BT will have the opportunity to recover its efficiently incurred costs overall. As set out in Annex 8, we forecast that as a result of the proposed dark fibre remedy some CISBO circuits, which are outside of the charge control baskets, will be replaced by dark fibre over the control period. We have considered whether BT may be denied the opportunity to recover its efficiently incurred costs if the contribution it earns from dark fibre is lower than the FAC of the cannibalised active services.

A6.115 To illustrate this effect, we consider the potential impact of a forecast new OSA 10Gbit/s connection being replaced by dark fibre. Figure A6.3 shows an illustrative forecast FAC for an OSA 10Gbit/s circuit. If this OSA 10Gbit/s circuit were to be cannibalised by dark fibre, there would likely be three effects:

- BT would no longer incur the long run incremental costs that are avoided as a result of supplying dark fibre, or in other words, the long run incremental costs of active-specific components (A in the diagram below). This would not pose any risk to cost recovery;
- BT would receive the dark fibre contribution to cost recovery (B in the diagram below); and
- there would be a per circuit shortfall in cost contribution between what BT would have received for an active OSA circuit and the contribution it receives from supplying dark fibre, illustrated by C in the diagram below. This would lead to a total shortfall equal to the per circuit shortfall multiplied by the volume of cannibalised active circuits.

[77] In other words, there is an overall FAC-based constraint, with BT free (subject to any sub-caps) to set prices within this overall constraint.

Figure A6.3: Illustration of potential risk to cost recovery as a result of cannibalisation of OSA circuit by dark fibre



A6.116 Therefore, where active circuits are forecast to make a greater contribution to cost recovery than dark fibre, there is a risk to BT's cost recovery if these circuits are cannibalised by dark fibre.

A6.117 To address this, we propose to include in the Ethernet basket, our estimate of the shortfall in costs recovered due to the cannibalisation of active circuits by dark fibre (i.e. C in the diagram above, for each circuit type, multiplied by the volume of cannibalised active circuits) – the rationale for including these in the basket is set out in Section 6.

A6.118 We now set out our view of the relevant measure of non-avoidable cost contributions of dark fibre and active circuits, before calculating the differential for cannibalised active circuits to be added back into the Ethernet basket.

Calculation of dark fibre contribution to costs

A6.119 In order to calculate the uplift to the Ethernet basket required to reflect the lost contribution from cannibalised active circuits, we need to make an assumption on the level of costs that BT could be expected to recover from dark fibre in 2018/19 (i.e. B in Figure A6.3 above). As explained in Section 8, we are proposing to require BT to set dark fibre prices on an EAD and EAD LA 1Gbit/s active price minus basis, where the minus reflects the avoided costs of the active circuit (i.e. A in Figure A6.3 above). While the charge control will permit BT to set EAD and EAD LA 1Gbit/s 2018/19 prices above or below our forecast FAC so long as the FAC constraint is satisfied for the basket as a whole, for the purposes of calculating the proposed uplift we have assumed that EAD and EAD LA 1Gbit/s prices will equal their forecast FAC in 2018/19. We have therefore estimated the non-avoidable cost contributions of active circuits by deducting the forecast long run incremental costs that are avoided as a result of supplying dark fibre from the forecast EAD and EAD LA 1Gbit/s FAC.

A6.120 We carried this out by, first, obtaining forecasts of 2018/19 FAC for EAD 1Gbit/s from the model. As we set out in our proposed guidance (in Section 8), we would expect BT to determine the dark fibre price based on an average across internal and external services.[78] However, for the purposes of our modelling for consultation, we have focussed on external costs for estimating the dark fibre FAC, since it simplifies the modelling (relative to an average approach to the dark fibre FAC), and has an immaterial impact on the level of the cost uplift described below. We have therefore chosen the external (and non-WECLA)[79] variants of EAD 1Gbit/s standard and local access as the reference products, as shown in Table A6.6 below.

Table A6.6: Reference products for dark fibre FAC

Service code	Service description
SD126	EAD 1000mb Rental-External-non-WECLA
SD129	EAD LA 1000b Rental-External-non-WECLA
SD135	EAD 1000mb Conn-External-non-WECLA
SD138	EAD LA 1000b Conn-External-non-WECLA

A6.121 Secondly, we estimated the long run incremental costs that are avoided as a result of supplying dark fibre for the reference products (i.e. A in Figure A6.3 above). Note, in practice, given the rationale behind our dark fibre pricing approach, this calculation effectively replicates the proposed dark fibre pricing calculation set out in Section 8.

A6.122 As set out in Section 8, on the basis of information gathered from BT, we analysed the component costs that are used to provide EAD 1Gbit/s to determine how these might be split into 'passive' (e.g. costs associated with the physical infrastructure such as duct and fibre) and 'active' (e.g. costs specifically related to the purchase of an active service from BT) elements. We identified the following cost components as containing active-specific costs:

- **Ethernet Electronics (CO485)** – this component covers the cost of BT software and equipment located at customer premises. Based on information provided by BT, we have assumed that [✂] of the costs of these components are active.[80] We calculated the active incremental costs of CO485 using the 2015 LLCC Model. First, we calculated the forecast 2018/19 FAC of CO485 attributable to the reference products by applying usage factors to the forecast FAC of those products. Second, we multiplied these figures by the relevant CVEs and AVEs to calculate the forecast 2018/19 LRIC of CO485 attributable to the reference products. Finally, we multiplied this figure by [✂] to calculate the active incremental costs.

[78] It is necessary to use an average as the unit costs of some active services (including 1Gbit/s EAD and EAD LA) are slightly different for internal and external sales, reflecting where BT purchases a different mix of service variants to external CPs. E.g., BT may purchase more or less of different service variants (e.g. resilience options), which are combined under a single service code.
[79] As set out in Section 9 of the May 2015 BCMR Consultation, dark fibre will apply only outside of the CLA.
[80] BT responses to the 10th s.135 notice dated 5 February 2015.

- **OR Service Centre - Assurance Ethernet (CL578)** – this covers the costs of fault reporting and fault resolution processes. Based on information provided by BT, we have assumed that [✂] of the costs of this component are active.[81] We calculated the active incremental costs of CL578 using the base year data gathered from BT and the 2015 LLCC Model. First, we used the base year data to calculate CL578 component costs as a proportion of the reference products' 2013/14 FAC. We applied these proportions to our forecast of the reference products' 2018/19 FAC.[82] Second we multiplied these figures by the relevant CVEs and AVEs to calculate the forecast 2018/19 LRIC of CL578 attributable to the reference products. Finally, we multiplied this figure by [✂] to calculate the active incremental costs.

- **Sales product management (CP502) and revenue/notional debtors (CD999)** – CP502 covers costs associated with activities such as choosing equipment, specifying active functionality, managing product change requests and sales overheads. CD999 covers the costs of Revenue debtors, which are part of the working capital for a service.[83] While we consider that these components are at least partly used for active-specific activities, it was not possible to directly estimate the proportions to allocate to the active incremental layer. We have therefore classified CP502 and CD999 costs as active incremental on the basis of the share of active incremental CO485 and CL578 costs relative to the overall EAD 1Gbit/s cost stack. First, we used the base year data to calculate CP502 and CD999 component costs as a proportion of the reference products' 2013/14 FAC. We applied these proportions to our forecast of the reference products' 2018/19 FAC. Second, we calculated that the active incremental costs of CO485 and CL578 accounted for approximately [✂] of the EAD 1Gbit/s FAC in 2018/19. Third, we applied this percentage to the forecast of the reference products' CP502 and CD999 2018/19 FAC.

A6.123 In addition, we consider that cumulo rates should be considered as an active incremental cost (as set out in Section 8). The 2015 LLCC Model does not forecast cumulo as a separate line item. However, using the base year cost data, we have been able to calculate cumulo costs as a proportion of non-pay operating costs in 2013/14. We multiplied these proportions by forecast 2018/19 non-pay costs for each reference product to calculate the active incremental costs.

A6.124 The total incremental costs of active elements were calculated by summing the shares of the forecast CO485, CL578, CP502 and CD999 component costs and the forecast cumulo costs.

A6.125 Finally, the dark fibre cost contribution (B in Figure A6.3 above) was then calculated by subtracting the forecast 2018/19 LRIC of active elements from the forecast 2018/19 FAC of the active reference products (as shown in Table A6.7 below).

[81] BT response to the 10th s.135 notice dated 5 February 2015.
[82] We used this method as CL578 is an admin component. It is not possible to apply usage factors to directly calculate how much of a component's cost is attributed to particular services.
[83] Revenue debtors are an estimate of the debts owed for each service based on BT's standard payment terms and assuming that the service is sold externally. See also BT's 2014 DAM p. 29.

Table A6.7: Calculation of dark fibre FAC contribution (£)

Dark fibre product	Reference product	A: 2018/19 EAD 1Gbit/s FAC	B: 2018/19 active incremental costs	Dark fibre FAC (A - B)
Dark Fibre Rental – Standard	EAD 1000mb Rental-External-non-WECLA	[✂]	789.89	[✂]
Dark Fibre Rental – Local Access	EAD LA 1000b Rental-External-non-WECLA	[✂]	752.83	[✂]
Dark Fibre Connection – Standard	EAD 1000mb Conn-External-non-WECLA	[✂]	7.95	[✂]
Dark Fibre Connection – Local Access	EAD LA 1000b Conn-External-non-WECLA	[✂]	2.56	[✂]

A6.126 We consider that the dark fibre cost contribution calculated using this method will reflect the 2018/19 forecast FAC of the passive components (e.g. relating to physical infrastructure such as duct and fibre) of EAD 1Gbit/s, as well as the fixed and common costs attributed to active components.

A6.127 We have calculated the total dark fibre cost contributions by multiplying the above per circuit contributions by the forecast dark fibre volumes (we set out our cannibalisation assumptions in Annex 8).

Calculation of the lost contribution from cannibalised active circuits

A6.128 Having identified the contribution to non-avoidable costs from dark fibre, we then needed to identify the cost contribution forgone from the active circuits forecast to be cannibalised. We consider that for the dark fibre products that will cannibalise EAD and EAD LA 1Gbit/s services, it is reasonable to assume that there will be no shortfall in cost recovery (given our proposed dark fibre pricing approach described in Section 8). Our calculation has therefore estimated the long run incremental costs that are avoided as a result of supplying dark fibre for each of the CISBO active circuits forecast to be cannibalised.[84] This is because BT will still incur the remaining costs when CISBO active circuits migrate to dark fibre, and so will need to be recovered. We set out the relevant CISBO services for which we have estimated the long run incremental costs that are avoided as a result of supplying dark fibre for in Table A6.8 below.

[84] Therefore in practice, this calculation replicates the calculation of dark fibre FAC contribution set out above, but for above 1Gbit/s services (rather than EAD and EAD LA 1Gbit/s).

Table A6.8: CISBO services forecast to migrate to dark fibre

Service code	Service description
SD301	WES MISBO rent-Internal-non WECLA
SD302	WES MISBO rent-External-non WECLA
SD303	WES MISBO conns Internal-non WECLA
SD309	Optical Services rent-Internal-non WECLA
SD310	Optical Services rent-External-non WECLA
SD315	Optical Services conns-Internal-non WECLA
SD316	Optical Services conns-External-non WECLA

A6.129 Therefore, for the set of services in Table A6.8, we calculated the incremental costs of active elements of the CO485, CL578, CP502 and CD999 components and cumulo costs using the 2015 LLCC Model and base year data on the basis of the methodology described above. These were summed to calculate the total long run incremental costs that are avoided as a result of supplying dark fibre for above 1Gbit/s services migrating to dark fibre. To calculate the contribution to non-avoidable costs by these active circuits (i.e. C in Figure A6.3 above), we then subtracted this figure from the forecast FAC of these services.

A6.130 We then calculated the total cost contributions which the cannibalised active circuits would have made if they were not replaced by dark fibre by multiplying the per circuit active contributions by the volume of cannibalised circuits (we set out our cannibalisation assumptions in Annex 8). This amount effectively equates to the total cost recovery required from the cannibalised active circuits.

Calculation of the shortfall in cost recovery

A6.131 Having identified the relevant cost contributions of dark fibre and cannibalised active circuits, we then calculated the total shortfall in cost recovery (i.e. equivalent to C in Figure A6.3 above, multiplied by cannibalised volumes). We did this by subtracting the total contribution from dark fibre from the total cost recovery required for the cannibalised active circuit types. Table A6.9 below presents the results of this calculation.

Table A6.9: Calculation of shortfall in cost recovery as a result of migration to dark fibre (£m)

Active above 1Gbit/s forecast to migrate to dark fibre	Total required cost recovery	Cost contribution from dark fibre	Shortfall in cost recovery
WES MISBO rent-Internal-non WECLA	[✂]	[✂]	[✂]
WES MISBO rent-External-non WECLA	[✂]	[✂]	[✂]
WES MISBO conns Internal-non WECLA	[✂]	[✂]	[✂]
Optical Services rent-Internal-non WECLA	[✂]	[✂]	[✂]
Optical Services rent-External-non WECLA	[✂]	[✂]	[✂]
Optical Services conns-Internal-non WECLA	[✂]	[✂]	[✂]
Optical Services conns-External-non WECLA	[✂]	[✂]	[✂]
Total	[✂]	[✂]	[✂]

A6.132 The total shortfall of about £4.6m is the amount of costs that we have added to the final year Ethernet basket cost stack. This cost uplift reflects differences in forecasts of non-avoidable costs between EAD 1Gbit/s (upon which the dark fibre price is based) and above 1Gbit/s services that are forecast to migrate to dark fibre.

Calculation of the uplift to Ethernet basket costs – dark fibre development and implementation costs

A6.133 BT will incur additional costs as a result of implementing a dark fibre remedy (over and above those currently incurred in providing active services only) which relate to the development of the dark fibre product. These additional costs can be grouped under the following broad headings:[85]

- *systems development costs*: changes are likely to be needed to a range of systems, including ordering and delivery systems; infrastructure planning and build systems; and testing, diagnostic and fault reporting systems. Changes to the billing systems may also be required;
- *training and operational costs:* this includes costs for training of planners, engineers and service agents to bring in the necessary changes to operational processes; and

[85] Based on BT response dated 13 February 2015 to Section D of the 10th s135 Notice dated 5 February 2015.

- *additional management overhead:* this includes costs associated with management and delivery of the new products, plus additional legal and commercial overhead costs associated with a new product portfolio launch.

A6.134 As discussed in Section 6, we propose that development costs are recovered from both the active and passive products by allocating them in the broad basket of Ethernet products.

A6.135 We note that some of the dark fibre development costs will be capitalised and depreciated over a life time longer than the current review period. We now set out our estimate of the appropriate level of these costs which should be included in the control.

Information we have gathered

A6.136 In order to estimate the efficient level of costs that BT would incur in relation to the development of dark fibre, we have looked at the most recent Statement of Requirement (SoR) submitted to BT which requested the development of a similar product. In particular we looked at SoR 8434 submitted by Vodafone on 18 November 2014 which requested that BT provides general dark fibre connectivity.

A6.137 We asked BT to provide us with its internal descriptions of the upgrades, system changes, operational training and resource impacts that would be required to implement this SoR.[86] We consider that this would provide a reasonable indication of the development costs which BT would incur for our proposed dark fibre remedy.

A6.138 BT responded that:

- its system development costs could be [✂] [in the range of £5m to £10m] which would be depreciated over a five year life time period;

- its operations/training costs could be [✂] [in the range of £10m to £20m], of which 25% would be depreciated over a ten year life time period; and

- its management overhead costs could be [✂] [in the range of £3m to £7m] (which would not be capitalised), plus [✂] [£1m to £2m] recurring management overhead cost for each year.

A6.139 Based on the information BT provided, we estimated the efficient costs that BT would incur for the development of a dark fibre product. Table A6.10 below shows a breakdown of BT's estimated dark fibre development costs, including the life time of any capitalised costs.

[86] BT response dated 13 February 2015 to Section D of the 10th s135 Notice dated 5 February 2015 and BT response dated 15 May 2015 to QE3 and QE4 of the 19th s135 Notice dated 11 May 2015.

Table A6.10: BT's estimated dark fibre development costs

Type of cost	Recurring costs				One-off costs
	Opex	Capex (total)	Life-time	Capex (p.a. of lifetime)	
Systems Development	[✂]	[✂]	[✂]	[✂]	[✂]
Operations / Training	[✂]	[✂]	[✂]	[✂]	[✂]
Management Overhead	[✂]	[✂]	[✂]	[✂]	[✂]
Total	[✂]	[✂]		[✂]	[✂]

Source: Ofcom, BT response dated 13 February 2015 to Section D of the 10th s135 Notice dated 5 February 2015, and BT response dated 15 May 2015 to QE3 and QE4 of the 19th s135 Notice dated 11 May 2015.

A6.140 We recognise that these estimates were based on a dark fibre remedy as requested in Vodafone's SOR rather than the specific remedy we propose here and in the May 2015 BCMR Consultation.[87] However we consider that this still provides a reasonable estimate for the 2015 LLCC Model given the similarities between the two. In order to check the reasonableness of BT's estimates and suggested asset life-time above we sent a number of follow-up questions seeking clarification of the information that BT provided. Following these checks, we believe that this data provides a reasonable basis upon which to base our dark fibre development costs estimate for the 2015 LLCC Model.

We propose to amortise capital costs in line with their expected lifetimes, and spread non-capitalised one-off development costs over the duration of the charge control

A6.141 Aside from on-going operating costs, BT is likely to incur most of its dark fibre development costs before the product is launched, i.e., in year one of the charge control. If we expect BT to recover all of these costs in year one of the charge control, this could cause a degree of pricing volatility during the period of the charge control and create an unnecessary risk of price shocks for end users. Therefore we need to consider how to spread the recovery of these costs in the charge control such that there is a reasonable opportunity for their recovery while smoothing the effect.

A6.142 In relation to the capitalised costs, we consider it appropriate to amortise their recovery over their expected lifetimes.

A6.143 In relation to the non-capitalised one-off development costs, we propose to smooth their recovery by spreading them over the duration of the charge control, i.e., we have allocated one third of the non-capitalised one-off development costs across each year of the charge control. These costs will therefore also be taken into account in the final year Ethernet basket cost stack, ensuring that the control provides an opportunity for BT to recover its efficiently incurred costs over the review period.

[87] BT has also informed us that the data has a lower level of accuracy as it was derived from its Rapid Impact Assessment.

A6.144 This approach results in the following estimate of dark fibre development costs for each year of the LLCC.

Table A6.11: BT's estimated dark fibre development costs per year of the LLCC

Type of cost	Cost per year of the control
One-off costs	[✂]
Capex	[✂]
Opex	[✂]
Total	[✂] [£5m to £10m]

Source: Ofcom, BT response dated 13 February 2015 to Section D of the 10th s135 Notice dated 5 February 2015, and BT response dated 15 May 2015 to QE3 and QE4 of the 19th s135 Notice dated 11 May 2015.

Proposal for dark fibre development costs

A6.145 In light of the above, we consider it appropriate to include [✂] [£5m to £10m] in dark fibre development costs in each year of the charge control.

The value of X and sensitivities

A6.146 Based on the approach described above, the model calculates cost and revenue forecasts for each service in the TI and Ethernet baskets until the final year of the charge control in 2018/19. The X values of the TI and Ethernet basket are then calculated so that by the final year of the control forecast revenues equal forecast efficient costs.

A6.147 Sections 6 and 7 set out our proposed approach to setting charge controls for the Ethernet and TI baskets respectively. Based on this analysis, we propose the following controls:

- for the Ethernet basket, a charge control of CPI-13.75%; and
- for the TI basket, a charge control of CPI-12.25%.

A6.148 The above values of X are the amount by which BT would need to reduce Ethernet and TI charges in each year of the charge control. We have calculated these values of X on the basis of our base case input assumptions as detailed in Annexes 7-9. As for any charge control modelling, many of the input assumptions are subject to some uncertainty and could change as a result of responses to the consultation or external factors requiring us to modify or update an assumption, e.g. in light of revised inflation forecasts. We have therefore undertaken a series of sensitivity tests to demonstrate how our calculated values of X vary with changes in the various input parameters.

A6.149 Table A6.12 below presents the results of our sensitivity analysis on the values of X for the Ethernet and TI baskets. We carried out the analysis by adjusting the following input assumptions:

- **June 2015 Cost Attribution Review overhead adjustments to base year costs:** in the base case, we have adjusted base year costs by approximately [✂]

to reflect the proposals on the attribution of General Overheads in the June 2015 Cost Attribution Review (see Annex 7). For the sensitivity analysis, we have modelled the impact of assuming there is no such adjustment to base year costs;

- **efficiency:** in the base case, we assume 5% annual efficiency saving on capital and operating expenditure (see Annex 8). For the sensitivity analysis, we have adjusted the efficiency assumption by plus and minus one percentage point (i.e. 4% and 7%) based on the analysis contained in Annex 8;

- **WACC:** in the base case, we assume 10.1% nominal pre-tax WACC (see Annex 9). For the sensitivity analysis, we have adjusted the WACC assumption by plus and minus one percentage point (i.e. 9.1% and 11.1%) based on the analysis contained in Annex 9;

- **operating cost inflation:** in the base case, we assume pay operating cost inflation of 2.5% and non-pay operating cost inflation of 2.6% (see Annex 8). For the sensitivity analysis, we have adjusted the pay and non-pay operating cost inflation by plus and minus one percentage point based on the analysis contained in Annex 8;

- **CVEs and AVEs:** in the base case, we use the CVEs and AVEs as set out in Annex 8. For the sensitivity analysis, we have scaled the CVEs and AVEs used by plus and minus 10%. As set out in Annex 8, CVES and AVEs are derived from LRIC to FAC ratios obtained from BT's LRIC model. The modelled sensitivities are not based on an analysis of likely ranges for CVES and AVEs, but are purely to illustrate the sensitivity of our values of X to changes in this parameter; and

- **volume forecasts:** in the base case, we use the service volume forecasts as set out in Annex 8. For the sensitivity analysis, we have scaled the volume forecasts used by plus and minus 10%. As set out in Annex 8, volume forecasts are derived from information provided by BT. The modelled sensitivities are not based on an analysis of likely ranges for volume forecasts, but are purely to illustrate the sensitivity of our values of X to changes in this parameter.

A6.150 In this analysis, we have modelled each sensitivity independently of one another.

Table A6.12: Outputs of sensitivity analysis

Scenario	Description	Ethernet basket	TI basket
Base case		CPI - 13.75%	CPI - 12.25%
June 2015 Cost Attribution Review overhead adjustment (removes c. [✂] from base year costs)			
	No June 2015 Cost Attribution Review overhead adjustment	CPI - 12.50%	CPI - 11.75%
Efficiency (5%)			
	4%	CPI - 13.25%	CPI - 12.00%
	7%	CPI - 14.75%	CPI - 13.50%
WACC (10.1%)			
	9.1%	CPI - 15.00%	CPI - 13.00%
	11.1%	CPI - 13.25%	CPI - 12.50%
Operating cost inflation (2.5% pay; 2.6% non-pay)			
	1.5% pay; 1.6% non-pay	CPI - 14.50%	CPI - 13.50%
	3.5% pay; 3.6% non-pay	CPI - 13.50%	CPI - 12.00%
CVEs and AVEs (component-level LRIC:FAC ratios)			
	Base case * (-10%)	CPI - 14.50%	CPI - 10.25%
	Base case * (+10%)	CPI - 13.50%	CPI - 15.00%
Volume forecasts			
	Base case * (-10%)	CPI - 12.75%	CPI - 11.25%
	Base case * (+10%)	CPI - 15.25%	CPI - 14.00%

A6.151 In all cases the model behaves as we would expect when the input assumption is changed, both in terms of the direction and the size of the change in the Ethernet and TI basket values of X. As set out in Sections 6 and 7, we consider that attempts to model the potential impacts of alternative input assumptions are unlikely to provide useful information for the purposes of setting ranges for the value of X. Consequently, we have used our regulatory judgement in setting a range of CPI-9.75% to CPI-17.75% for the Ethernet basket and CPI-6.25% to CPI-14.25% for the TI basket. Nevertheless, we note that each of the modelled sensitivities lie within the boundaries of the proposed ranges.

Annex 7

Base year costs and adjustments

Introduction

A7.1 The starting point when modelling a charge control using a top down approach is to establish a relevant cost base, which we refer to as the base year costs for the charge control. Our starting base year costs and adjustments were calculated within a standalone model (2015 Base Year Model). The outputs of the 2015 Base Year Model were then used as inputs into our 2015 LLCC Model (discussed in Annex 6) which we then use to forecast the efficiently incurred costs (the costs that will be allowed for under the control) over the course of the charge control period.

A7.2 We discuss the base year costs and adjustments in a number of sections in this June 2015 LLCC Consultation. In Section 4, we set out our framework for determining base year costs. In Section 5, we discuss whether to base the control on BT's costs of provision or those of another operator, the choice of cost standard and the data period used for base year. In Sections 6 and 7, we discuss our proposals in relation to the technology upon which to base our cost forecasts and whether adjustments to the base data are required. To compliment these main sections, this annex describes how we have determined the base year cost adjustments by:

- recapping our starting point for our base year costs; and
- detailing the impact of our proposed base year cost adjustments.

Summary of our proposals

A7.3 We propose to use the 2014/15 RFS as our base year for the 2016 LLCC. In our cost modelling in the June 2015 LLCC Consultation, we use BT's 2013/14 RFS as the starting point for our Base Year Model as this is the latest fully audited set of regulatory accounts at our disposal.

A7.4 We make the following adjustments within our 2015 Base Year Model.[88]

Table A7.1: Summary of adjustments to our Base Year Model

Proposed Adjustment	Ethernet FAC Impact (£'m)	TI FAC Impact (£'m)
13/14 RFS Total	559.8	338.1
Access cards	(35.4)	(0.2)
June 2015 Cost Attribution Review - Errors	0.8	(18.2)
June 2015 Cost Attribution Review - General Overheads	(34.9)	(13.5)

[88] Based on 2013/14 RFS and market structure which approximates with the proposed market structure.

RAV	(10.0)	(2.4)
Cumulo	14.3	11.4
Transmission Equipment	(8.4)	-
Restructuring Costs	(8.1)	(4.5)
Quality of Service resource uplift	4.2	-
SLG Payments	(13.0)	-
Credit Notes	-	(2.0)
TI Volumes	-	(8.5)
13/14 Revised Total	469.3	300.3

We propose to use BT's 2014/15 RFS as our starting point for base year costs

A7.5 We propose that the starting point for the base year costs will be BT's 2014/15 RFS once published. The 2014/15 RFS will be the latest fully audited set of regulatory accounts at our disposal for the purpose of carrying out the charge control modelling for the 2016 LLCC. BT's 2014/15 RFS will be BT's view of its costs in 2014/15 and its attribution of those costs. For the purposes of this consultation we have taken the 2013/14 RFS as our starting point for the base year costs in the Base Year Model.

A7.6 The data supplied by BT in response to our information requests has provided us with detailed disaggregation of costs that have been derived from the 2013/14 RFS.[89] BT has provided disaggregated financial data for 2013/14 on a component basis for business connectivity services at the same level of aggregation as those reported in the 2013/14 RFS.[90]

We propose to make a number of adjustments to derive our base year costs

A7.7 We propose to adjust the cost data we have received from BT to ensure that these costs are the relevant level of costs on a forward looking basis for setting the 2016 LLCC. In identifying potential adjustments we have considered whether the cost data is consistent with previous regulatory decisions (in both the March 2013 BCMR Statement and other recent market reviews such as the June 2014 FAMR

[89] A full list of the information requests sent to BT under this review can be found in Annex 16.
[90] Network components are the underlying elements of infrastructure/activities that make up each service. Every service reported by BT uses one or more components. For example, PPC 64kbit/s link uses the following components: PC rental 64kbit link, SG&A partial private circuits and SG&A private circuits. BT's total network costs are disaggregated into network components. The costs of a service are then dependent on the amount of costs attributed to these components, which is described in BT's 2014 DAM.

Statement and the June 2014 WBA Statement), whether it contains any obvious errors or inappropriate accounting methodologies, and whether there are any 'one off' costs that should be excluded.

A7.8 Potential adjustments have been identified by considering four questions:

- **Did the base year reflect decisions made for the March 2013 BCMR Statement?** In setting the 2013 LLCC, we made a number of adjustments that disallowed certain costs.[91] Whilst the May 2014 Regulatory Financial Reporting Statement requires BT to ensure the RFS are consistent with relevant regulatory decisions,[92] the framework had not been implemented in relation to business connectivity markets in 2013/14. We have therefore investigated whether the 2013/14 RFS included the adjustments determined appropriate in the March 2013 BCMR Statement;

- **Did the base year reflect decisions made in other recent market reviews?** Since the March 2013 BCMR Statement, we have published the September 2013 Narrowband Statement, June 2014 FAMR Statement and June 2014 WBA Statement. While decisions made in those market reviews did not directly apply to the business connectivity markets, we have considered whether any of the decisions made were relevant to business connectivity services;

- **Did scrutiny of the RFS reveal any potentially inappropriate costs or attributions?** Following our May 2014 Regulatory Financial Reporting Statement, we have conducted a detailed review of BT's cost attribution system (June 2015 Cost Attribution Review). The purpose of this review was to improve our understanding of BT's cost attribution system, identify the key attribution methodologies and determine whether those methodologies are appropriate. Our consultation on our findings and our proposed changes to BT's attribution methodologies is published separately. We engaged consultants, Cartesian, to inform our review and we have published Cartesian's report alongside the June 2015 Cost Attribution Review. We have also reviewed BT's March 2015 Methodology Review and the 2013 and 2014 Reconciliation Reports[93]for any accounting methodology changes that have been inappropriately included in business connectivity markets or which should have been appropriately included in business connectivity markets; and

- **Are there any one off costs that should be excluded?** For charge control modelling purposes the base year data should only include costs which are expected to recur on an ongoing basis. We therefore exclude one off costs.

A7.9 Ofcom is required to use its regulatory judgement when proposing which adjustments to make to the base year data. However, we also welcome views and representations from stakeholders.

[91] Figure A12.2, March 2013 BCMR Statement.
[92] Principle 4, Annex 3, May 2014 Regulatory Financial Reporting Statement.
[93] The May 2014 Regulatory Reporting Statement and March 2015 Directions Statement requires BT to publish a list of all methodology changes it is planning to make to its RFS by the end of the financial year (March) it plans to make those changes within the 'Methodology Review' including the estimated (based on the previous financial year) impacts of those changes: March 2015 Methodology Review. When it published the RFS (July) BT must also publish a report which includes all the methodology changes and errors within the RFS 'Reconciliation Report' including its calculation of the actual impacts of those changes: 2013/14 BT Report requested by Ofcom and 2014/15 BT Report requested by Ofcom.

Our assessment of the potential base year adjustment

A7.10 In this section, for each potential base year adjustment identified, we assess whether an adjustment should be made and then calculate the potential impact of the adjustment on the costs[94] attributed to Ethernet and TI services. In the case of Ethernet, we mean the services currently included in the AISBO Non-WECLA market.[95] In the case of TI services, we mean low bandwidth services in the UK (excluding Hull) and services above 8Mbit/s outside the WECLA and Hull (the latter represent a small proportion of overall TI costs and they are excluded from our TI basket when forecasting costs and revenues).

Access cards (other services)

Assessment of the adjustment

A7.11 In the March 2013 BCMR Statement we found that some costs relating to BT's 21CN network were allocated to Ethernet and TI services on a future benefit basis, in that those costs were currently not incurred to deliver Ethernet and TI services. [96] We decided that this treatment was not appropriate and removed the relevant costs and MCE[97] (but not the 'Unavoidable costs') from the March 2013 BCMR Statement.[98]

A7.12 On reviewing the 2013/14 data provided by BT, we found that the same 21CN cost components continued to be allocated to business connectivity market services.[99] Both Ethernet and TI services continued to be allocated the 21CN Super Cost Component CN001 'Access cards (other services)':

- **Ethernet -** Cost Component CN881 relates to High Bandwidth Customer Data Cards and Cost component CN901 relates to Ethernet switches. These are the same cost components which were excluded in the 2013 LLCC; and
- **TI -** Cost Component CN881 relates to MSAN TDM Card and was excluded in the 2013 LLCC.

A7.13 The costs included in the base year data provided by BT for both the Ethernet and TI cost components are set out in Table A7.2 for all business connectivity market services.

Table A7.2: Access cards (Other services) base year costs

	Ethernet Network Components		TI Network Component
Cost	CN882 £'m	CN901 £'m	CN881 £'m

[94] These are CCA FAC costs with an assumed WACC of 10.1% (Annex 9).
[95] We propose an adjustment for the LP at the modelling stage (Annex 6).
[96] Paragraphs 20.247 – 20.252 and paragraphs 19.174 – 19.200, March 2013 BCMR Statement.
[97] Mean Capital Employed.
[98] Figure A12.3 and Figure A12.5, March 2013 BCMR Statement
[99] As part of the analysis we have carried out in relation to our proposed dark fibre remedy (section 8), we have also scrutinised the applicability of the Access cards (other services) cost components to the proposed dark fibre remedy.

Pay	[✂]	[✂]	[✂]
Non Pay	[✂]	[✂]	[✂]
Depreciation	[✂]	[✂]	[✂]
Total CCA	[✂]	[✂]	[✂]
MCE	[✂]	[✂]	[✂]
ROCE@10.8%	[✂]	[✂]	[✂]
Total FAC Cost	[✂]	[✂]	[✂]

Source: BT response dated 12 November 2014 to Q B3, B4, B5 and C6 of 1st s135 notice dated 7 August 2014.

Assessment

A7.14 In the March 2013 BCMR Statement we said "*[w]e consider that these costs should be recovered against services delivered over the 21CN network, and not against current services which do not use this network*"[100] and "[w]*e do not consider that these costs should be recovered from existing customers. This is because the costs are going to either enable provision of a future service that is outside the charge control or a more efficient delivery of an existing service in the future*".[101]

A7.15 In the March 2015 Directions Statement we concluded that "*we do not consider that BT's future benefits approach is an appropriate way to allocate costs for 21CN services".*[102]

A7.16 We asked BT to confirm whether the equipment recorded under the Access cards (other services) cost components was used to provide business connectivity market services (either now or in the future). BT replied "*The equipment recorded under components CN882 and CN901 - Ethernet Switch Access Cards and Ethernet Switch Costs - is used to provide Harmonised Ethernet and Managed Ethernet Access Service (HE/MEAS). We are investigating if any equipment recorded under CN882 and CN901 is being used for AI and MI services, and EBD in particular.*"[103] BT continued "*Once our investigations are complete, a new service will be created in the REFINE system for 2014/15 that will exhaust entirely the costs within CN882 and CN901 that are associated with HE/MEAS. This service will be reported within the Residual market.*"[104]

A7.17 HE/MEAS is not a service in the business connectivity market. HE/MEAS is a downstream service.[105] [✂] BT no longer intends to allocate these costs to

[100] Point 6, Figure A12.3 and point 7 Figure A12.5; March 2013 BCMR Statement.
[101] Point 7 Figure A12.5 March 2013 BCMR Statement.
[102] Para 4.214 March 2015 Directions Statement.
[103] BT response dated 10 February 2015 to Q B1-B4 of 10th s135 notice dated 5 February 2015.
[104] BT response dated 10 February 2015 to Q B1-B4 of 10th s135 notice dated 5 February 2015.
[105] BT, *Ethernet Private Networks*, http://business.bt.com/networking/ethernet/?msgtype=23&s_cid=btb_ppc_maxus_google_g_ethernet_managed_-_broad_managed_core_-_broad_broad_+managed_+ethernet&gclid=CjwKEAjw-

business connectivity services as set out in its March 2015 Methodology Review.[106] We note that the name of the Access cards (Other services) super-component has been split changed to Ethernet Switch Access HE/MEAS and Ethernet Switches HE/MEAS for the 2014/15 RFS.[107] BT will reflect the March 2015 Methodology Review in its 2014/15 RFS which we propose to use as the base year for our 2016 BCMR Statement.

A7.18 We therefore propose to exclude these Access card costs from our 2015 Base Year Model that have been allocated to Ethernet services. We also propose to exclude the small amount of these costs that have been allocated to TI services.

Calculation of the adjustment

A7.19 As BT had included the costs relating to Access cards (other services) in the 2013/14 base year data, we propose to remove all the costs from our 2015 Base Year Model.

A7.20 In the March 2013 BCMR Statement, we allowed BT to recover the 'unavoidable' element of costs allocated to the Access card components[108] from business connectivity services. In respect of Ethernet services, as the underlying Access card assets should have been allocated to services in the residual market, any 'unavoidable' costs included within Access cards should also be excluded from Ethernet services. The impact on Ethernet and TI services is set out in Table A7.3 below.

Table A7.3: Impact on Ethernet and TI services of proposed adjustment for Access cards

Proposed Adjustment	Impact on Ethernet services FAC (£'m)	Impact on TI services FAC (£'m)
Access cards	(35.4)	(0.2)

June 2015 Cost Attribution Review - Errors

Assessment of the adjustment

A7.21 As described in Section 7 of the June 2015 Cost Attribution Review, we have identified mathematical or input errors in the spreadsheets and calculations used by BT to attribute some of its costs. These errors affect the costs attributed to several markets, including the business connectivity markets. As we explain in Section 7 of the June 2015 Cost Attribution Review, we asked BT to estimate the impact of correcting these errors; the estimated impact of correcting the errors on the costs attributed to the business connectivity markets is as set out in Table A7.4.[109]

ZqrBRDt_KjhjcbzhhISJAAlRGvlTj10mLOz6eUf2CLFV5zevIPloRhCyoDhygcHH57cSBoCljnw_wcB&dclid=CMn6pOm55MUCFa5jwgodCMsAiQ

[106] Paragraph 3.8, BT, March 2015 Methodology Review.
[107] Page 177, March 2015 Directions Statement.
[108] Figure A12.3 and Figure A12.5, March 2013 BCMR Statement.
[109] BT response dated 13th February to 'Template B 9market impacts)' of 11th s135 notice dated 13 February 2015.

Table A7.4: Impact of correcting errors in the business connectivity markets identified in the June 2015 Cost Allocation Review

	£'m
1 Core and backhaul fibre allocation	2.5
2 Access fibre allocation	(5.5)
3 Core/backhaul duct allocation to 21CN	(6.4)
4 BT Wholesale overheads	(6.1)
5 Other errors (x 13 errors)	(3.4)
Total impact	(18.9)

Source: June 2015 Cost Attribution Review

A7.22 In connection with the fifth category in Table A7.4, while we have not had a specific materiality threshold in mind when deciding which errors to reflect in the 2015 Base Year Model, errors one to four all affect the FAC of business connectivity markets individually by at least £2.5m. Of the remaining thirteen errors in this 'other' category, none had an impact greater than £1m on Ethernet or £0.8m on TI, and in most cases were significantly less. We note that the X in CPI-X for TI and Ethernet baskets is currently rounded to the nearest 0.25% (see Annex 6) and therefore it is not sensitive to small variations in the base data costs.[110] Therefore, we do not intend to make an adjustment for these other errors. BT has confirmed that all of the errors in Table A7.4[111] will be corrected in the 2014/15 RFS, which we intend to use as the base year for our 2016 BCMR Statement.[112]

Calculation of the adjustment

A7.23 As set out in the Table A7.4, in the June 2015 Cost Attribution Review we estimate that the effect of correcting the errors identified is to move costs of £18.9m away from business connectivity markets. Having made the further adjustments described below (in Table A7.5 the effect on the 2013/14 base year costs for these errors is to move £17.5m away from the services covered by this consultation.

Table A7.5: Reconciliation of the impact of errors identified in the June 2015 Cost Attribution Review

	FAC (£'m)
Impact of the adjustment identified in June 2015 Cost Attribution Review in business connectivity markets	(18.9)
Add back 'Other errors' not proposed for 2016 LLCC[113]	3.4

[110] Broadly, a change in FAC of less than £5m would not affect the X for the Ethernet basket while a change in FAC of less than £1m would not affect the X for the TI basket.
[111] As we have removed all Access cards costs, BT's decision has no consequence.
[112] Section 7, June 2015 Cost Attribution Review.
[113] For the reason set out above we do not propose including this adjustment within our base year model.

Less adjustment for unregulated services[114]	(2.0)
Other Adjustments and roundings	0.1
Impact of adjustment on business connectivity markets in the 2016 LLCC	(17.4)
Impact on Ethernet Services	0.8
Impact on TI Services	(18.2)
Impact of adjustment on business connectivity markets in the 2016 LLCC	(17.4)

June 2015 Cost Attribution Review – General Overheads[115]

Assessment of the adjustment

A7.24 In the June 2015 Cost Attribution Review we explain our proposal on the treatment of General Overheads.

A7.25 Subject to the outcome of the consultation on the June 2015 Cost Attribution Review, we propose to adjust our base year costs in the 2016 LLCC to reflect the new attribution bases.

Calculation of the adjustment

A7.26 In the June 2015 Cost Attribution Review we propose that the General Overheads attribution should be broken down into smaller categories and alternative attribution bases be used, based on our understanding of the underlying nature of the costs and how the costs are incurred. We will reflect any changes to the requirements concerning BT's attribution methodologies in the 2016 BCMR Statement.

A7.27 For the purpose of this consultation, the June 2015 Cost Attribution Review estimates the possible impact of these proposed changes on the costs attributed to regulated services in general and the business connectivity markets in particular. We calculate this adjustment by allocating General Overheads on the basis of Previously Allocated Costs. We explain in more detail the June 2015 Cost Attribution Review how we do this. The impact across business connectivity services identified in the June 2015 Cost Allocation Review is reproduced in Table A7.6 below.

[114] The impact set out in the June 2015 Cost Attribution Review excluded the impact on unregulated services within the business connectivity markets. Our base year model includes data and adjustments for these services.
[115] Section 8, June 2015 Cost Attribution Review

Table A7.6 Impact on business connectivity markets of reattributing General Overheads identified in the June 2015 Cost Allocation Review

	£'m
Reattribute General Overheads	(55)

Source: Table 8.1, June 2015 Cost Attribution Review

A7.28 As set out in Table A7.6, in the June 2015 Cost Attribution Review, we estimate that the effect of attributing General Overheads on the Previously Allocated Cost basis is to move costs of £55m away from business connectivity markets. Having made the further adjustments described below (in Table A7.7), the effect of the change in allocation in the 2015 Base Year Model is to move costs of £53m away from the services covered by this consultation.

Table A7.7: Reconciliation of the impact of the change in the allocation of General Overheads identified in the June 2015 Cost Attribution Review

	CCA (£'m)
Impact of the adjustment identified in June 2015 Cost Attribution Review in business connectivity markets	(55)
Adjustment for unregulated services[116]	1
Adjustment for Access cards[117]	1
Impact of proposed adjustments on business connectivity markets in the June 2016 LLCC	(53)
Ethernet Services	(35)
TI Services	(14)
Other Services (AISBO WECLA and MISBO) markets	(4)
Total	(53)

[116] The impact set out in the June 2015 Cost Attribution Review excluded the impact on unregulated services within the business connectivity markets. Our 2015 Base Year Model includes data and adjustments for these services.

[117] As we have removed all Access cards costs from the Base year model as described above we do not need to make any further Access card adjustments.

A7.29 Table A7.8 sets out the proposed adjustment impact on both Ethernet and TI services, which we propose to incorporate into our 2015 Base Year Model.[118]

Table A7.8 Impact on Ethernet and TI services of proposed adjustment for General Overheads identified in the June 2015 Cost Attribution Review

Adjustment	Impact on Ethernet services CCA (£'m)	Impact on TI services CCA (£'m)
June 2015 Cost Attribution Review – General Overheads	(34.9)	(13.5)

RAV

Assessment of the adjustment

A7.30 One of the proposed SMP conditions in the May 2015 BCMR Consultation would, if adopted, require BT to prepare the Regulatory Financial Statement on a RAV basis.[119] We consulted and decided in the May 2014 Regulatory Financial Reporting Statement that the RFS should be prepared on the RAV basis. We explained that the CCA basis of preparation which BT previously used to value assets meant that we had to make an adjustment for each charge control and investigation. We noted that we had implemented the RAV consistently in recent charge controls and our decisions had been appealed by stakeholders and upheld by the CAT. We therefore decided that it was appropriate to align the RFS with this policy. For the same reasons we consider that it is appropriate to propose the RAV adjustment to the base year.[120]

A7.31 In order for the base year data to be consistent with how current prices are set and how BT's access copper and duct assets will be valued in the 2014/15 RFS, we therefore adjust our 2013/14 base year costs to a RAV adjusted basis.

A7.32 In the BT's March 2015 Methodology Review, BT stated that it intends to publish its 2014/15 RFS (including in relation to business connectivity markets) on a RAV adjusted basis which we intend to use as the base year for our 2016 BCMR Statement.

Calculation of the adjustment

A7.33 We asked BT to calculate the impact of valuing access copper and duct assets in relation to business connectivity markets on a RAV adjusted basis. BT provided the

[118] We only calculated the CCA opex adjustment as we did not have the data in the granular form to calculate the ROCE impact. Due to the nature of the costs being adjusted, we believe the ROCE impact would be around 4% and would not be material

[119] Proposed SMP condition 11.10, May 2015 BCMR Consultation

[120] We set out the justifications for our proposals and decisions concerning the RAV in paragraphs 5.33 to 5.41 of the December 2013 Regulatory Financial Reporting Consultation and paragraphs 3.87 to 3.81 of the May 2015 Regulatory Financial Reporting Statement.

impacts on a cost component and service basis. From this data we have calculated the proposed adjustment impact on both Ethernet and TI services as set out in Table A7.9 below. We incorporate these adjustments into our 2015 Base Year Model.

Table A7.9 Impact on Ethernet and TI services of proposed RAV adjustment

Proposed Adjustment	Impact on Ethernet services FAC (£'m)	Impact on TI services FAC (£'m)
RAV	(10.0)	(2.4)

Cumulo

Assessment of the adjustment

A7.34 BT's Cumulo rates costs are the non-domestic rating costs BT pays on its rateable network assets and are described in more detail in Section 8. We propose to make two adjustments:

- adjust the attribution of BT's cumulo rates costs; and
- adjust BT's total Cumulo rates costs in 2013/14.

A7.35 Since 2010 BT has attributed its Cumulo rates costs on one basis and the rebates it receives on a different basis.[121] BT attributes the gross Cumulo rates costs to network components on the Profit Weighted Net Replacement Costs (PWNRCs) of all the rateable assets. For rebates that BT has received as a result of increased unbundling of its local loops, BT allocates the rebate against a subset of the rateable assets more associated with BT's Core Network Assets.

A7.36 In the June 2014 FAMR Statement we concluded that "*we did not now consider that BT's 2010/11 allocation of cumulo costs to MPF and WLR is reasonable*".[122] As a result of this conclusion we directed BT to change the way that it attributes Cumulo rates costs for the purposes of preparing the RFS from 2014/15 in the March 2015 Directions Statement[123] (we refer below to this particular part of the March 2015 Directions Statement as the Cumulo Direction). The Cumulo Direction will bring the attribution of BT's Cumulo rates costs in the 2014/15 RFS into line with how we set regulated prices in the June 2014 FAMR Statement.[124]

A7.37 Under the Cumulo Direction BT has to attribute all non NGA related Cumulo costs in the same way, with the relevant profit weight being the relevant weighted average cost of capital for each market. We have adopted the same formula set out in the Cumulo Direction to calculate our proposed adjustment (see below).[125]

[121] Pages 53-55, BT's 2014 DAM.
[122] Paragraph A26.58, June 2014 FAMR Statement.
[123] March 2015 Directions Statement.
[124] Whilst the Cumulo Direction only applied in the FAMR and WBA, as per section 3.12 in BT's March 2015 Methodology Review, BT will implement the change across all markets.
[125] Para 1.6 of Part 2 of the March 2015 Directions Statement.

A7.38 The base year data for this charge control has been provided by BT from its 2013/14 RFS and therefore predates the Cumulo Direction. The first adjustment we propose to make therefore is to adjust the attribution of BT's Cumulo rates in line with the Cumulo Direction. This will not only make the attribution of these costs consistent with that used in the June 2014 FAMR Statement but it will also make it more consistent with how Cumulo will be attributed within BT's 2014/15 RFS.

A7.39 BT's Cumulo rates costs in 2013/14 contained significant rebates that related to payments for liabilities in 2010/11, 2011/12 and 2012/13. These 'prior year' rebates are non-recurring costs and are therefore not appropriate to include within the 2015 Base Year Model. We therefore propose a second adjustment to BT's total Cumulo rates costs in 2013/14 that removes these prior year rebates. We believe this provides a more appropriate starting point from which to forecast costs. We have applied the revised attribution basis within our first adjustment to this revised amount of Cumulo rate costs.

Calculation of the adjustment

A7.40 To estimate the revised attribution of Cumulo rates costs we used the formula within the Cumulo Direction in the March 2015 Directions Statement.

A7.41 As described more fully in the March 2015 Directions Statement, BT provided the mean net replacement costs (NRCs) for its main rateable assets in 2013/14.[126] However we had to include an appropriate attribution base for specialised buildings[127] as these are also rateable assets but were not included in BT's data.[128] This involved estimating the NRC of these buildings and then attributing this across network components. We discuss how we have done this below.

A7.42 BT provided us with two estimates of the NRCs of specialised buildings. The first reflected the value of the buildings in place at 1 April 2010 using values as at 1 April 2008.[129] The second reflected the buildings in place at 1 April 2011 using values at 1 April 2011.[130] BT was not able to provide us with the value of the specialised estate in 2013/14 using 2013/14 values. We have used the NRCs estimate that reflected the estate at 1 April 2011. We believe this represents a reasonable proxy for the NRC of the specialised buildings. Within certain bounds the overall allocation does not appear particularly sensitive to the value of specialised buildings. Further we believe there has been little change in the composition of BT's specialised estate over the last few years and any increase in land and buildings values since 2011/12 will have been offset, at least to some extent, by increased depreciation.

A7.43 We attributed this estimate of the NRCs of Specialised Buildings in 2013/14 across network components in the same way that BT attributes rent on Operational Buildings using information provided by BT.[131]

A7.44 For the profit weights we used the applicable rate of return on capital employed for each component as within BT's Regulatory Financial Statements.[132] This rate of return is also reported within BT's published RFS for many SMP components.[133]

[126] BT response dated 5 December 2014 to questions A6 and A7 of 7th s135 request dated 1 December 2014.
[127] Buildings of an operational nature such as local exchanges.
[128] Page 54, BT's 2014 DAM.
[129] BT response dated 11 March to supplementary question 3 of s135 request dated 24 February 2015.
[130] BT response dated 11 March to supplementary question 3 of s135 request dated 24 February 2015.
[131] BT response dated 5 December 2014 to question A9 of 7th s135 request dated 1 December 2014.

A7.45 Application of the formula within the Cumulo Direction produced a revised attribution base for Cumulo rates costs in 2013/14. This new base moved costs out of fixed access markets (WFAEL-WLR and WLA-LLU services) and into other markets, including business connectivity markets. We believe the effect produced a more reasonable attribution than we had observed within BT's 2013/14 RFS. Within that original allocation WLR and WLA services accounted for over [✂][134] of total costs and there were negative attributions to both Ethernet and TI services. These 2013/14 allocations will however also have been affected by prior year rebates that BT received in 2013/14.

A7.46 We identified the effect of these prior year rebates on BT's 2013/14 Cumulo rates costs from information that BT provided.[135] We verified these amounts within each of England, Scotland, Wales and Northern Ireland using public information on BT's Cumulo rateable value in each nation, the appropriate rates in the pound and transition rules that affected BT's payments in England in 2010/11, 2011/12 and 2012/13.[136] The effect of removing these prior year rebates was to increase BT's Cumulo rates costs in 2013/14.

A7.47 We applied the revised apportionment base to the revised BT cumulo costs in 2013/14 and incorporated the resulting revised costs by component and by service into our 2015 Base Year Model. These adjustments impacted both Ethernet and TI services as set out in Table A7.10 below.[137]

Table A7.10 Impact on Ethernet and TI services of proposed adjustment for Cumulo

Proposed Adjustment	Impact on Ethernet services CCA (£'m)	Impact on TI services CCA (£'m)
Cumulo	14.3	11.4

Transmission equipment

Assessment of the adjustments

A7.48 Until 2010/11, BT recovered the cost of the transmission equipment deployed at either end of an Ethernet circuit and which is wholly dedicated to that service, through the local end connection charges. BT also capitalised and depreciated this equipment over its useful economic life. BT changed its RFS treatment in 2010/11 to recover the cost of equipment through rental charges. It capitalised the cost of pre 2010/11 equipment which we excluded from the March 2013 BCMR Statement to prevent double recovery of costs.

A7.49 In the March 2013 BCMR Statement, we made an adjustment to match costs and revenues by eliminating MCE and depreciation of the assets and replacing them with a measure of the fully expensed cost of the equipment on connection.

[132] BT's Additional Financial Information Schedules AFI1-4 provided confidentially to Ofcom include the applicable rate of return on capital for all network components.
[133] Pages 122-129, BT 2013/14 RFS. See for example Appendix 1.1, pages 127-129 BT's 2014 DAM.
[134] BT response dated 30 September 2014 to question B4 of 1st s135 request dated 7 August 2014.
[135] BT response dated 5 December 2014 to questions A1, A3-15 of 7th s135 request dated 1 December 2014.
[136] Legislation affecting transition rules: *The Non-Domestic Rating (Chargeable Amounts) (England) Regulation 2009* http://www.legislation.gov.uk/uksi/2009/3343/pdfs/uksi_20093343_en.pdf
[137] We only calculated the CCA opex adjustment as we did not have the data in the granular form to calculate the ROCE impact which we believe would have been small.

A7.50 On reviewing the 2013/14 base year data provided by BT, we found that BT has included the cost of Ethernet transmission equipment which had been deployed prior to 2010/11.

A7.51 To be consistent with how current prices are set and in order to prevent BT from over-recovering the cost of transmission equipment through rental charges that have already been recovered through connection charges prior to 2010/11, we propose to remove the costs associated with transmission equipment assets capitalised before 2010/11.

Calculation of Adjustment

A7.52 BT has provided a breakdown of MCE and depreciation costs within the 2013/14 RFS relating to transmission equipment costs capitalised before and after 2010/11. In particular, BT provided information in relation to the Ethernet Electronics cost component (CO485) on a service basis. We incorporate this adjustment in relation to Ethernet services only within our 2015 Base Year Model as set out in Table A7.11 below.

Table A7.11 Impact on Ethernet services of proposed adjustment for Access cards Transmission Equipment

Proposed Adjustment	Impact on Ethernet services FAC (£'m)
Transmission Equipment	(8.4)

Restructuring Costs

Assessment of the adjustment

A7.53 As part of our review of BT's 2013/14 Statutory Financial Statements for 'one off' items we have identified that BT had £276m of 'Group Wide' restructuring costs which it incurred in 2013/14 in relation to restructuring its business.[138]

A7.54 We recognise in our efficiency calculations that costs, such as leaver payments, are incurred to deliver net efficiencies (see Annex 8). These costs themselves should be efficiently incurred and should exclude costs that do not deliver efficiencies to business connectivity services.

A7.55 We asked BT to explain this restructuring cost and its relevance to business connectivity market services. BT said that this cost "*is made up of people and property charges of £217m (leaver costs, property exit costs) and networks, products and procurement channels rationalisation charges of £59m*".[139] Of this £276m, approximately [✂] is allocated to business connectivity markets.

A7.56 This restructuring cost does not appear to be forward looking. These costs were primarily for leavers and property and network rationalisation activities and were

[138] BT plc, Annual Report, p.63 http://www.btplc.com/Sharesandperformance/Annualreportandreview/pdf/2014_BT_Annual_Report_smart.pdf
[139] BT response dated 21 October 2014 to question B1 of 2nd s135 request dated 3 October 2014.

part of a 'group wide' programme, neither of which appear relevant to the business connectivity market.

A7.57 The [✂] of leaver costs allocated to business connectivity market services is additional to the leaver costs of [✂] which are included within the wages and salaries costs. Our assessment is that this [✂] represented a 'normal' level of leaver costs that might be associated with a company like BT (and which we should take into account in the charge control); while the [✂] of 'group restructuring' leaver costs are more 'one-off' in nature. We therefore propose to exclude all of the additional restructuring costs (over and above the [✂] 'normal' leaver payments) from the 2015 Base Year Model.

Calculation of the adjustment

A7.58 BT has provided a breakdown of the restructuring costs services in the business connectivity market, which amounted to £[✂].[140] BT also provided a breakdown of restructuring costs allocated to cost components used wholly or partially by business connectivity services which amounted to £[✂].[141] We combined these two sources of information to calculate on a component by service basis that £[✂] of cost should be removed from Ethernet and TI services and therefore adjusted our 2015 Base Year Model. The proposed adjustment impacts Ethernet and TI services as set out in Table A7.12 below.

Table A7.12: Impact on Ethernet and TI services of proposed adjustment for restructuring costs

Proposed Adjustment	Impact on Ethernet services FAC (£'m)	Impact on TI FAC services (£'m)
Restructuring costs	(8.1)	(4.5)

Quality of Service resource uplift

Assessment of the adjustment

A7.59 In Section 6 and in Section 13 of the May 2015 BCMR Consultation we propose to allow BT in the 2016 LLCC to cover its efficiently incurred resource costs associated with improving its quality of service on an ongoing basis. BT also has a backlog of provisioning orders, but we regard the cost associated with this as being a 'one off' cost and therefore propose to exclude this element from the 2015 Base Year Model.

A7.60 As set out in Section 6, BT has recruited additional staff and contractors in 2014/15 to improve its quality of service. BT has provided the total additional annual pay related costs and other costs (incurred and expected) in 2014/15. This data is set out in Table A7.13 below.

[140] BT response dated 21 October 2014 to question B1 of 2nd s135 notice dated 3 October 2014.
[141] BT response dated 21 October 2014 to question B1 of 2nd s135 notice dated 3 October 2014.

Table A7.13: Total Openreach Quality of Service Improvement Plan – Staffing Requirements

2014/15	Q1	Q2	Q3	Q4	Annual	Ave cost £'k
	Actual	Actual	Actual	Forecast	Forecast	Forecast
Additional Job Control FTE (end Qtr)		[✂]	[✂]	[✂]	[✂]	
Additional pay for Job Control FTE (£m)		[✂]	[✂]	[✂]	[✂]	[✂]
Less element of capitalised pay (£m)		[✂]	[✂]	[✂]	[✂]	
Additional net pay for Job Control (£m)		[✂]	[✂]	[✂]	[✂]	
Additional Planning FTE (end Qtr)		[✂]	[✂]	[✂]	[✂]	
Additional pay for Planners (£m)		[✂]	[✂]	[✂]	[✂]	[✂]
Less element of capitalised pay (£m)	[✂]	[✂]	[✂]	[✂]	[✂]	
Additional net pay for Planners (£m)	[✂]	[✂]	[✂]	[✂]	[✂]	
Additional Field Engineers (Direct Labour) FTE (end Qtr)		[✂]	[✂]	[✂]	[✂]	
Additional pay for Field Engineers (£m)		[✂]	[✂]	[✂]	[✂]	[✂]
Less element of capitalised pay (£m)		[✂]	[✂]	[✂]	[✂]	
Additional net pay for Field Engineers (£m)		[✂]	[✂]	[✂]	[✂]	
Additional Field Contract FTE (end Qtr)		[✂]	[✂]	[✂]	[✂]	
Additional pay for Field Contract (£m)		[✂]	[✂]	[✂]	[✂]	[✂]
Grand total additional FTE					[✂]	
Grand total additional pay (£'m)					[✂]	[✂]
Grand total capitalised Pay (£m)					[✂]	
Grand total net pay (£'m)					[✂]	

Source: BT response dated 6th February to question B1 of S135 dated 2nd February 2015.

A7.61 In addition, BT has also confirmed it has "*…no current plans to increase overall resource levels. Of course, as with any large organisation, our resourcing plans will remain subject to review and may change in future.*"[142]

A7.62 We therefore include the incremental staffing costs relevant to business connectivity services, as set out in Table A7.14, in our 2015 Base Year Model.

Calculation of the adjustment

A7.63 The data set out in Table A7.13 above relates to all Openreach activities rather than business connectivity services. It therefore includes additional costs relating to NGA and Copper services which should not be included in business connectivity services.

A7.64 In order to obtain the costs relevant only to business connectivity services we requested the information from BT.

A7.65 Based on the data set out in table A7.13, we asked BT to provide us with the estimated costs for business connectivity services (i.e. excluding all Copper and NGA impacts) together with the methodology used to calculate the capital and non-capital elements. We asked for the information on a cost component by service basis.

A7.66 In its response, BT said [✂].

A7.67 [✂].

A7.68 [✂].

A7.69 For the purposes of our 2015 Base Year Model, we exclude the additional cost relating to TI services given that the proposals on quality of service in Section 13 of the 2015 May BCMR Consultation only relate to Ethernet. We also uplift the depreciation costs by a factor of two to convert them into full year figures. The proposed adjustment within our 2015 Base Year Model impacting Ethernet services only is set out in Table A7.14 below.

Table A7.14: Impact on Ethernet services of proposed Quality of Service resource uplift

Proposed Adjustment	Impact on Ethernet services FAC (£'m)
Quality of Service resource uplift	4.2

[142] BT response dated 10 March to follow up question A3 of s135 notice dated 6 March 2015.

Service Level Guarantees (SLGs)

Assessment of the adjustment

A7.70 SLGs are contractual payments made by BT to CPs to compensate for BT's failure to meet agreed performance criteria (such as time taken to complete an installation) set out in the Service Level Agreements. As set out in Section 6, we propose to allow BT to recover SLG payments consistent with those incurred in 2011, as this represents a reasonable level of SLG payments that we might expect given our proposed minimum QoS standards.

Calculation of Adjustment

A7.71 In order to calculate this adjustment, we have:

- gathered information from BT in relation to the total SLG payments it made for leased lines services in 2013/14 and removed these from our base year costs. According to BT, it spent approximately [✂] on SLG payments in 2013/14. We then identified the cost components that SLG payments are allocated to as OR Service Centre – Assurance Ethernet (CL578) and OR Service Centre – Provision (CL573).[143] We removed the [✂] relating to SLG payments from both these cost components from our base year (equating to about [✂of these component cost totals).

- calculated the average payment per SLG had the lead times been at 2011 levels. To do this, we first gathered monthly information on BT's SLG payments and its volumes of leased lines completed orders and SLG incidents between 2011 and 2013/14. This information indicated that in 2011 about [✂] of orders were subject to SLGs and that the average payment per SLG incident was [✂]. This compares to a 2013/14 SLG rate of about [✂] and an average payment of [✂]. We calculated that the number of SLG incidents in 2013/14 would have been approximately [✂] had the SLG rate been at the 2011 level. We then calculated that the average payment per SLG in 2013/14 would have been approximately [✂] had the lead times for the delivery of services been at 2011 levels. This was done by adjusting the 2011 average payment per SLG to take into account the charge control in place during this period.

- finally, we added the SLG payments commensurate with QoS in 2011 into the base year costs. We calculated the SLG payments commensurate with QoS in 2011 by multiplying the number of SLG incidents in 2013/14 using the 2011 SLG rate by the payment per SLG in 2013/14 using 2011 lead times. This gave a figure of approximately [✂] which we added into the base year costs for the two cost components.

A7.72 As set out in Section 6, in the 2016 LLCC we intend to use BT's actual SLG payments going forward from the 2014/15 RFS. This is because BT's actual additional resource costs associated with Quality of Service improvements should mean that actual SLG payments in 2014/15 are at a reasonable level. However, if SLG costs are not, we are likely to make similar adjustments to the 2014/15 base year costs in the 2016 LLCC.

[143] Using the descriptions set out in the BT's 2014 DAM.

A7.73 The proposed adjustment within our 2015 Base Year Model impacting Ethernet services only is set out in Table A7.15 below.

Table A7.15: Impact on Ethernet services of proposed adjustment for SLGs costs

Proposed Adjustment	Impact on Ethernet services FAC (£'m)
SLG	(13.0)

Credit Notes

Assessment of the adjustment

A7.74 BT brought to our attention a mis-posting of a PPC rebate payable to CPs in relation to SLG payments.[144] Payments to CPs for PPC rebates which should have been a debit to income, were instead posted as a debit to SLG costs. This is a straightforward error, which we propose to correct. BT has indicated it will correct this error in its 2014/15 RFS

Calculation of Adjustment

A7.75 BT provided a breakdown of the impact of correcting the error on a cost component by service basis.[145] We propose to include this adjustment as set out in Table A7.16 below in our 2015 Base Year Model.

Table A7.16: Impact on TI services of proposed adjustment for Credit Notes

Proposed Adjustment	Impact on TI services FAC (£'m)
Credit Notes	(2.0)

TI Volumes

Assessment of the adjustment

A7.76 BT brought to our attention a miscounting of TI volumes, cost and revenues in the 2013/14 RFS. BT identified that in relation to (mainly) Featurenet rentals:[146]

- 64kbit/s volumes were overstated by [✂] of the total); and
- 2 Mbit /s volumes and costs were overstated by [✂] circuits.

[144] Meeting on 22 January 2015 between BT and Ofcom.
[145] BT response dated 11 March to question B3 of 14th s135 notice dated 9 March 2015.
[146] Email from BT to Ofcom 11 March 2015.

A7.77 BT estimated the total revenue overstatement was around [✂]; the cost overstatement was much less because [✂] of costs relating to 2 Mbit/s Featurenet circuits had been (incorrectly) attributed to the Residual market.

A7.78 We note that BT intends to correct this error going forward as set out in its March 2015 Methodology Review[147] which will be incorporated in its 2014/15 RFS.

Calculation of Adjustment

A7.79 BT provided an (estimated) breakdown of the impact of correcting the error on a cost component by service basis[148]. We propose to include this adjustment, affecting TI services only, as set out in Table A7.17 below in our 2015 Base Year Model.

Table A7.17 Impact on TI services of proposed adjustment for TI Volumes

Proposed Adjustment	Impact on TI services FAC (£'m)
TI volumes	(8.5)

TSO Electricity

Assessment of adjustments

A7.80 This adjustment was proposed by BT and relates to how BT attributes Electricity costs to business connectivity services.[149] There are two elements to the proposed adjustment:

- [✂];[150] and
- [✂].

A7.81 [✂].

A7.82 [✂].

A7.83 [✂].

A7.84 The June 2015 Cost Attribution Review (Section 9) has also investigated TSO electricity attributions and found a number of issues with the models BT used to attribute electricity costs. Given the time frame available to investigate the various adjustments and the fact that the adjustment impacts other markets to a greater extent than business connectivity markets, we have not made an adjustment in our 2015 Base Year Model but instead intend to carry out a more detailed review of electricity within the next stage of the June 2015 Cost Attribution Review. On the basis that we conclude on this next stage in advance of our 2016 BCMR Statement

[147] Section 3.19, BT, March 2015 Methodology Review.
[148] BT updated response dated 31 March to question B3-B5 of 1st s135 notice dated 7 August 2014.
[149] Meeting on 5 March 2015 between BT and Ofcom.
[150] BT response dated 11th March to question C1 of 14th s135 notice dated 9 March 2015.

and finalising our 2016 LLCC, we will consider whether it is appropriate to reflect an adjustment to electricity costs in our base year model.

Payment Terms

Assessment of the adjustment

A7.85 Part of the capital employed relevant to business connectivity services includes the cost to BT of financing its payment term offers to CPs. BT reflects this cost as a notional debtor on which it receives a regulated return. We identified this potential adjustment as it was made in the May 2013 BCMR Statement. In the March 2013 BCMR Statement we found that notional debtors did in fact not reflect the payment terms it offered to CPs. We found notional debtors to be overstated, which in turn overstated BT's MCEs. In addition we also found several errors; both internal and external notional debtors were being recorded as 'internal debtors' and cash items were being recorded in the external debtors and creditors categories.

A7.86 We therefore have reviewed the 2013/14 base year data provided by BT for any material mis-posting within net current assets.

A7.87 We have checked if there are any differences in BT's notional debtors from the actual payment term offers to CPs. Based on the 2013/14 RFS we have calculated notional debtor days across the business connectivity markets to be very close to 20 days, which is in line with the average payment terms offered to CPs. We therefore do not propose to make an adjustment for payment terms within our 2015 Base Year Model.

Our proposed base year cost adjustments

A7.88 Our proposed base year adjustments are set out in Table A7.18 and A7.19.

Table A7.18: Summary of all the proposed adjustments – Ethernet

Proposed Adjustment	Ethernet Opex £'m	Ethernet Capital £'m	Ethernet FAC Impact (£'m)	Ethernet MCE £'m
13/14 RFS Total	386.7	173.1	559.8	1,618.7
Access cards	(30.6)	(4.9)	(35.4)	(48.1)
June 2015 Cost Attribution Review - Errors	(1.1)	1.9	0.8	19.2
June 2015 Cost Attribution Review - General Overheads	(34.9)	-	(34.9)	-
RAV	(5.8)	(4.2)	(10.0)	(41.6)
Cumulo	14.3	-	14.3	-
Transmission Equipment	(8.3)	(0.1)	(8.4)	(0.8)
Restructuring Costs	(8.1)	-	(8.1)	-
Quality of Service resource uplift	2.6	1.7	4.2	16.4
SLG Payments				

	(13.0)	-	(13.0)	-
13/14 Revised Total	301.7	167.6	469.3	1,563.7

Table A7.19: Summary of all the proposed adjustments - TI

Proposed Adjustment	TI Opex (£'m)	TI Capital (£'m)	TI FAC Impact (£'m)	TI MCE (£'m)
13/14 RFS Total	258.1	80.0	338.1	792.4
Access cards	(0.2)	(0.0)	(0.2)	(0.4)
June 2015 Cost Attribution Review - Errors	(10.9)	(7.3)	(18.2)	(72.0)
June 2015 Cost Attribution Review - General Overheads	(13.5)	-	(13.5)	-
RAV	(1.4)	(1.0)	(2.4)	(9.9)
Cumulo	11.4	-	11.4	-
Restructuring Costs	(4.5)	-	(4.5)	-
Credit Notes	(2.0)	-	(2.0)	-
TI Volumes	(6.0)	(2.4)	(8.5)	(24.2)
13/14 Revised Total	231.0	69.3	300.3	685.8

Annex 8

Forecasting assumptions

Introduction

A8.1 This annex explains the main assumptions we have made to forecast costs and revenues for the purpose of modelling the charge controls. In this annex, we set out our analysis for our assumptions relating to:

- volume changes;
- the relationship between costs and volumes;
- efficiency changes; and
- asset and input price changes.

A8.2 The WACC is discussed separately in Annex 9.

Volume changes

Methodology and Approach

A8.3 Service volume forecasts are a key determinant of the values of X for the TI and Ethernet baskets; they drive both our cost and revenue forecasts.

A8.4 As we are forecasting the costs and revenues of BT's TI and Ethernet leased lines, our volume forecasts are based on BT's volumes (and not, for example, market-wide volumes). Furthermore, BT's leased lines consist of a significant number of different products (e.g. PPCs, RBS, EAD, WES, etc.), bandwidths and charging elements (for example connections, local ends and main links). Our cost model requires forecasts for each product and charging element, as the unit costs are likely to vary across these dimensions.[151] For example, the network components used to provide a local end can be different to those used to provide a main link.

A8.5 Our model also requires forecasts for business connectivity services outside the scope of the charge control (for example TI services above 8Mbit/s and Ethernet and WDM services above 1Gbit/s).This is because the costs for controlled services may also depend on the demand for non-controlled services due to the presence of economies of scale and scope in the provision of leased lines. Furthermore, in the case of the Ethernet basket, non-controlled services are relevant in terms of modelling the impact of our proposed dark fibre remedy.

A8.6 There are two ways in which volume forecasts can be generated for a charge control model; a 'top-down' or a 'bottom-up' approach. The latter involves identifying a set of volume drivers for different types of leased lines and modelling forecasts

[151] Though, as discussed in Annex 6, we estimate costs and revenues based on the service codes that BT uses in its regulatory accounting system. Some of these service codes aggregate multiple services (for example the service code for internal EAD 1Gbit/s rental outside the WECLA includes the standard EAD 1Gbit/s product as well as the extended reach variant and the resilience options).

based on the future trends of the relevant drivers.[152] A 'top-down' approach involves taking current volumes and generating forecasts based on relevant evidence, such as historical trends and forecasts from network operators and industry analysts. It does not seek to identify specific volume drivers and quantify their impact on leased line volumes.

A8.7 Consistent with the 2013 LLCC, we have adopted a top-down approach to forecasting leased line volumes. Identifying the relevant volume drivers for leased lines is very difficult as they are likely to include a range of factors such as number of specific business types,[153] economic growth, number of households and population. Furthermore, as our model requires volume forecasts for a large number of different products and charging elements, we would have to quantify the impact of each driver on each product/element. Given the scale of such a task, we do not consider it proportionate or practical to derive volume forecasts using a bottom-up approach. In this regard, we note that none of the CPs or industry analysts from whom we have obtained information on forecast volumes use a bottom-up approach when forecasting leased line volumes.

A8.8 We have therefore derived our volume forecasts by reviewing a number of relevant leased line forecasts provided by BT, other CPs and forecasts developed by two independent industry analysts. While we consider all evidence in the round, we consider that BT's forecasts are of particular importance, for two reasons:

- first, BT forecasts services at the level of granularity required for our model (i.e. for each product and charging element, split by internal and external customers), whereas the forecasts we have obtained from other CPs and industry analysts are at a much more aggregate level (e.g. 100Mbit/s Ethernet rentals); and

- second, as discussed above, the charge control requires us to forecast BT's volumes. We consider BT to be better positioned to understand the demand for its own services relative to other stakeholders. This is because BT provides services for a wide range of customers and uses (e.g. access and backhaul) whereas other operators often have narrower requirements, which means their sales/purchases can be focused on a particular service or bandwidth.

A8.9 A potential concern in using volume forecasts obtained from BT is that it may have an incentive to 'game' the charge control by submitting biased forecasts.[154] For example, in the case of growing Ethernet services BT may have an incentive to under-forecast volume growth such that Ofcom's forecast reductions in unit costs are not as large as BT actually expects them to be. However, as we explain in more detail below, we consider that this risk of gaming is mitigated by:

- using the volume forecasts that BT uses for its internal business planning (rather than using forecasts that are specifically prepared for the LLCC);

[152] Depending on the product, volume drivers for a telecommunications service may include the number of households, number of businesses, GDP, disposable income etc. A bottom-up model would quantify the impact of each of these on service volumes and it would then use forecasts of each driver to generate the volume forecasts.
[153] For example, the number of small/medium/large businesses in each sector or industry.
[154] We note that other stakeholders may also have similar (albeit opposing) incentives when submitting alternative forecasts.

- assessing BT's historical forecasting accuracy (where possible and feasible) and drawing any relevant insights from this assessment for the current forecasting period; and

- considering BT forecasts in the round alongside a range of relevant forecasts from a range of non-BT sources.

A8.10 For the current consultation, we obtained detailed forecasts from both BT Wholesale and Openreach for TI and CISBO (i.e. Ethernet and WDM) services respectively. BT produces a BT Group forecast that is used for business planning purposes. The Group forecast is dependent on forecasts submitted and agreed with each line of business (LOB). The forecast is updated twice per year and it underpins the budget and targets for each LOB. It therefore represents the formal commitment of the LOB in terms of the contribution it will make to BT Group. The forecasts are also aligned such that volumes submitted by upstream LOBs are aligned to the volumes submitted by downstream LOBs.[155] Given that the forecasts we use feed into BT's internal targets that represent formal commitments for each LOB (including all services, both regulated and unregulated), we do not consider it likely that they have been 'gamed' for the purposes of the leased lines charge control.

A8.11 Furthermore, BT explained that its forecasts draw on a number of sources, including [✂].[156] We have therefore analysed BT's forecasts in a detailed manner by checking the accuracy of BT's previous forecasts (presented during the 2013 LLCC) by comparing them to outturn volumes for the relevant years (we have also done the same exercise with Ofcom's forecasts in the 2013 LLCC) and considering long-term historical trends. This has allowed us to check whether BT has systematically under- or over-forecast volumes.

A8.12 We have also compared the trends predicted by BT's forecast to those predicted by OCPs and industry analysts.[157] Where there are significant differences between forecasts, we generate our forecasts based on evidence in the round, taking into account all of the volume forecasts received.

A8.13 Below, we set out our analysis of the volume forecasts for TI and Ethernet services. For both types of service, we structure the analysis as follows:

- we start by discussing the current trends and key market developments that we expect to materialise during the charge control period;

- we then compare the forecasts that were prepared during the 2013 LLCC by both Ofcom and BT with actual outturns in order to assess whether there was any systematic bias in the forecasts;

- we analyse BT's current forecast and review it in the context of longer-term historical trends;

- we then compare BT's forecasts with those of other CPs and industry analysts to check for consistency; and

[155] BT response dated 5 September 2014 to questions A7–A9 of the 1st s135 notice dated 7 August 2014.
[156] BT response dated 5 September 2014 to questions A7-A9 of the 1st s135 notice dated 7 August 2014.
[157] As OCPs and analysts do not forecasts to the degree of granularity that BT does, our comparisons are carried out at the more aggregate level (for example 'Ethernet 100Mbit/s rentals' rather than specific 100Mbit/s products such as EAD, EAD LA, WES etc.)

- last, we conclude by presenting our volume forecasts.

A8.14 For Ethernet services, we also explain how we have forecast demand for the proposed dark fibre remedy and how we forecast this to impact active Ethernet volumes during the charge control period.

A8.15 Following this consultation and before the 2016 BCMR Statement is published, we will update our analysis to reflect outturn 2014/15 volumes and, if necessary, we will update our volume forecasts.

Volume forecasts for TI services

Key developments and market trends

A8.16 As discussed in the May 2015 BCMR Consultation, there are three main drivers for the declining volumes in the TI market:

- BT has signalled to end-users that it is ending support for the PDH platform that supports sub-2Mbit/s services due to obsolescence of the equipment;
- a large number of TI users are increasing their bandwidths above 10Mbit/s or higher (where Ethernet is the cheaper technology); and
- the widespread availability of NGA broadband and Ethernet First Mile services to support higher upload and download speeds using Wholesale Local Access remedies (i.e. LLU and VULA).[158]

A8.17 As a consequence, many (though not all) customers are expected to migrate from TI to higher bandwidth services delivered using Ethernet (including EFM) and other technologies; the Ethernet forecasts are consistent with this view of growth in high bandwidth services.

A8.18 However, it is likely a significant proportion of customers will remain on TI services over the charge control period, particularly those with specialised requirements. Furthermore, as set out in the May 2015 BCMR Consultation, TI remains a cheaper technology for users with low bandwidth needs (i.e. below 10Mbit/s).[159]

Accuracy of previous LLCC forecasts

A8.19 Using volume information from the previous charge control, we have been able to assess the accuracy of Ofcom's forecasts and the forecasts BT submitted as part of the 2013 LLCC for 2012/13 and 2013/14.

A8.20 In the case of TI volumes, this historical comparison cannot be made on a like-for-like basis due to BT recently identifying some errors in the 2013/14 volumes reported in its RFS.[160] However, although some caution is required in drawing conclusions from the analysis, it is still a consideration in our overall analysis.

A8.21 Our analysis of BT's initial volume data (i.e. before the error was corrected) showed that [✂] reported in the 2012/13 and 2013/14 RFS, with a difference [✂] in

[158] Section 5, May 2015 BCMR Consultation.
[159] Section 5, May 2015 BCMR Consultation.
[160] See Annex 7 for further details.

2013/14.[161] However, our analysis of BT's updated data (which corrects for the volume error) shows that [✂], as shown in Figure A8.1 and Figure A8.2.

Figure A8.1: BT Wholesale's 2012 forecast, Ofcom's March 2013 BCMR Statement and outturn TI service volumes, sub-2Mbit/s

[✂]

A8.22 For the sub-2Mbit/s services, BT Wholesale's 2012 forecast was based on a slower decline compared to the outturn in 2013/14 (over-forecasting by approximately [✂] local ends or around [✂]), although its forecasts in 2012/13 were close to actual out-turns.

A8.23 Ofcom's 2012 forecast was based on a rate of decline faster than that predicted by BT Wholesale's 2012 forecast, but still lower than the outturn rate of decline, thus forecast volumes were above outturn in 2013/14 (over-forecasting by approximately 9 thousand local ends or 25%).

Figure A8.2: BT Wholesale's 2012 forecast, Ofcom's March 2013 BCMR Statement and outturn TI service volumes, 2Mbit/s

[✂]

A8.24 For 2Mbit/s services, BT Wholesale's 2012 forecast was based on a more rapid decline compared to the outturn in 2012/13 and 2013/14 (under-forecasting by approximately [✂] local ends or [✂] in 2013/14).

A8.25 Ofcom's 2012 forecast [✂] volumes were below outturn in 2013/14 (under-forecasting by approximately 40 thousand local ends or 27%).

A8.26 Given the above analysis, it does not appear that the forecasts BT submitted in the 2013 LLCC were biased in a particular direction, nor did Ofcom systematically over- or under-forecast volumes for all services. However, we note that the differences in the mix of volumes (i.e. the relatively fast decline of sub-2Mbit/s services and the relatively slower decline of 2Mbit/s services) was one of the reasons why BT's return on capital in 2013/14 was higher than we forecast in the 2013 LLCC (see Annex 5 for further details). We have therefore considered whether BT's latest forecasts are likely to result in similar differences going forward.

Analysis of BT Wholesale's current forecast

A8.27 BT Wholesale's current forecast is based on a continuing decline of TI service volumes. In terms of local ends, the decline is [✂] for the RBS 2Mbit/s services ([✂] decrease by 2018/19, or [✂] annual decrease over the forecast period) and for the PPC 64Kbit/s services ([✂] decrease by 2018/19, or annual decrease of [✂] over the forecast period). RBS sub-2Mbit/s and PPC 2Mbit/s services are predicted to decline at a [✂] ([✂], respectively, by 2018/19, or an annual decrease of [✂]

[161] BT response dated 22 January 2015 to question B1 of the 8th s.135 notice dated 12 January 2015.

over the forecast period).[162] The forecast trends for the most important service types and bandwidths are presented in Figure A8.3.[163]

Figure A8.3: BT Wholesale's forecast trend for local ends (PPC 64Kbit/s and 2Mbit/s, RBS sub-2Mbit/s and 2Mbit/s)

[✂]

A8.28 We have also analysed BT Wholesale's forecast for TI services by charging element (local ends, links, distribution, trunk and new connections). We note that the trend for links, distribution and trunk is very similar to that for local ends presented above. New connections for RBS sub-2Mbit/s and 2Mbit/s services are forecast to decline to [✂] by 2015/16 and 2016/17, respectively, while the decline for PPC new connections is predicted to be [✂] ([✂] for 64Kbit/s and 2Mbit/s, respectively by 2018/19). This is presented in Figure A8.4.

Figure A8.4: BT Wholesale's forecast trend for new connections (PPC 64Kbit/s and 2Mbit/s, RBS sub-2Mbit/ and 2Mbit/s)

[✂]

A8.29 We have also reviewed BT Wholesale's current forecast in the context of a longer-term historical trend. This is presented in Figure A8.5 and Figure A8.6 for sub-2Mbit/s and 2Mbit/s local ends, respectively.

Figure A8.5: BT Wholesale's current forecast and historical trend (Sub-2Mbit/s)

[✂]

Figure A8.6: BT Wholesale's current forecast and historical trend (2Mbit/s)

[✂]

A8.30 BT Wholesale's current forecasts for the sub-2Mbit/s and 2Mbit/s services do not appear to be [✂] with the declining trends observed since 2009/10 and 2008/09, respectively.

Analysis of current forecasts of BT Wholesale, OCPs and industry analysts

A8.31 We have received TI volume forecasts from an industry analyst and four operators. The four operators comprise two mobile operators and two fixed operators. Between these operators they accounted for the majority (more than [✂]) of BT's

[162] [✂] The chart presents an indexed trend rather than actual volumes due to significant variations by product.
[163] The forecasts in this chart use indices, with 2013/14 as the base year. This means that if the value of the index in 2014/15 is 90, volumes for that particular service are forecast to decline by 10% from 2013/14.

external PPC revenues in 2013/14.[164] Their forecast trends are shown in Figure A8.7.[165] The trends demonstrate a broadly consistent view of declining TI demand.

Figure A8.7: Comparison of TI volume forecasts, up to and including 2Mbit/s

[✂]

A8.32 Figure A8.7 above shows that all the forecasts predict declining demand for services up to and including 2Mbit/s,[166] though the rates of decline vary between the forecasts. Although BT's forecast decline of 2Mbit/s services in 2012 turned out to be overstated in the following two years, most of these forecasts are now anticipating a strong decline in the period between 2014/15 and 2018/19 (including the independent analyst). This is particularly pronounced for the forecasts we have received from [✂], which is consistent with BT's forecast reduction of [✂] illustrated in Figure A8.3.[167]

A8.33 However, we note that [✂], is forecasting a slower decline, which is consistent with BT's [✂] in Figure A8.4. Furthermore, a significant proportion of BT Wholesale's TI sales remain internal (around [✂] per cent in 2013/14).[168] On this basis, we consider the rate of decline for low bandwidth TI services forecast by BT represents a reasonable forecast for low bandwidth TI volumes and therefore we have primarily based our forecasts on BT's.

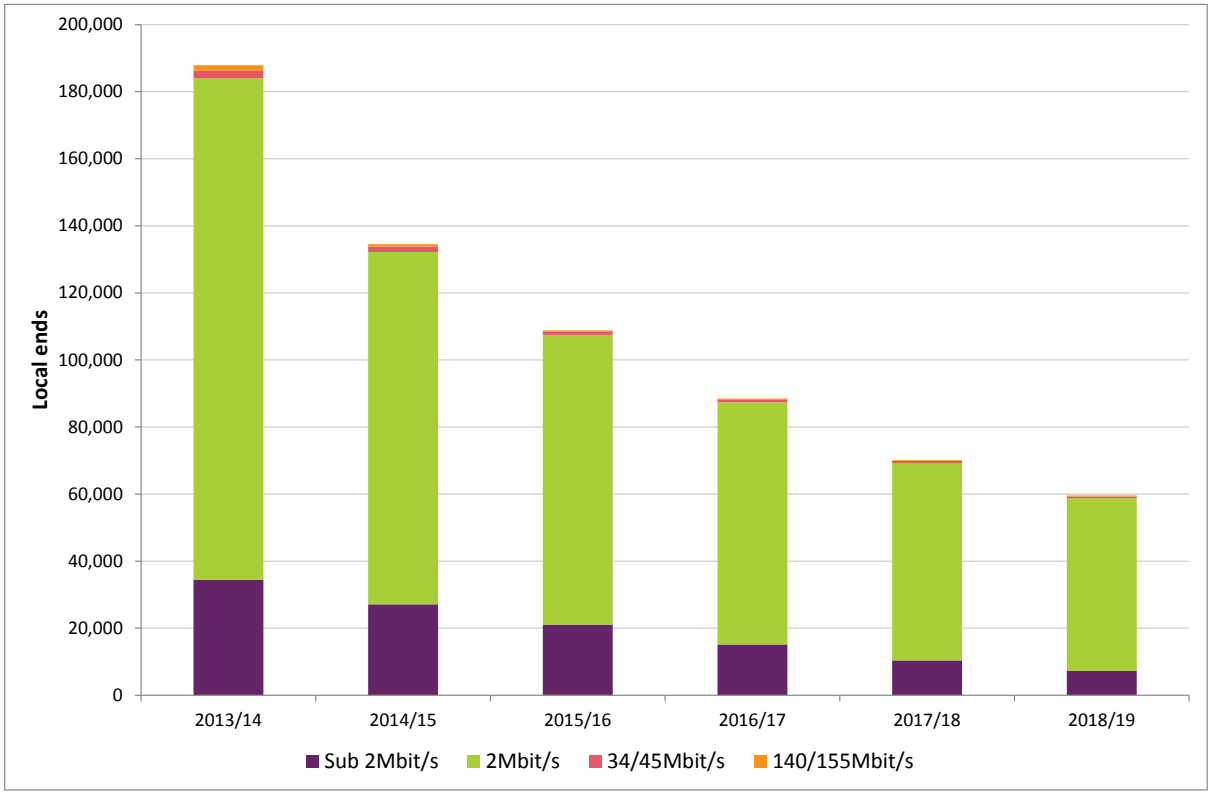
Ofcom's forecast of TI service volumes

A8.34 Given the evidence and analysis presented above, we predict an overall decline in the demand for sub-2Mbit/s and 2Mbit/s TI terminating segments. We consider this to be reasonable as we expect continuing migration from TI to Ethernet and other services in the short-to-medium term (including by mobile operators), but in the longer term there will be a small but significant number of customers that are less willing and/or able to switch from TI.

A8.35 By the end of this charge control, we expect the total number of sub-2Mbit/s and 2Mbit/s TI local ends to decline by approximately 68% compared to 2013/14 (around 20% reduction per annum). We forecast stronger decline for sub-2Mbit/s services (around 27% reduction per annum) compared to 2Mbit/s services (around 19% reduction per annum). This is consistent with the recent trends we have observed as well as information received from BT, other operators and the industry analyst, all of whom forecast faster decline in sub-2Mbit/s services.

[164] BT response dated 31st October 2014 to question A2 of the 3rd s.135 notice dated 21 October 2014.
[165] The chart presents an indexed trend rather than actual volumes as the latter are not generally comparable between CPs and independent analysts (for example BT often sells more than other operators, while analysts do not include leased lines used for backhaul).
[166] The 2Mbit/s services are particularly important as these currently make up the majority of TI volumes.
[167] [✂].
[168] Updated BT response dated 25 March 2015 to question B1 of the 13th s.135 notice dated 26 February 2015.

Figure A8.8: Ofcom's forecast of TI services to 2018/19 (number of local ends)



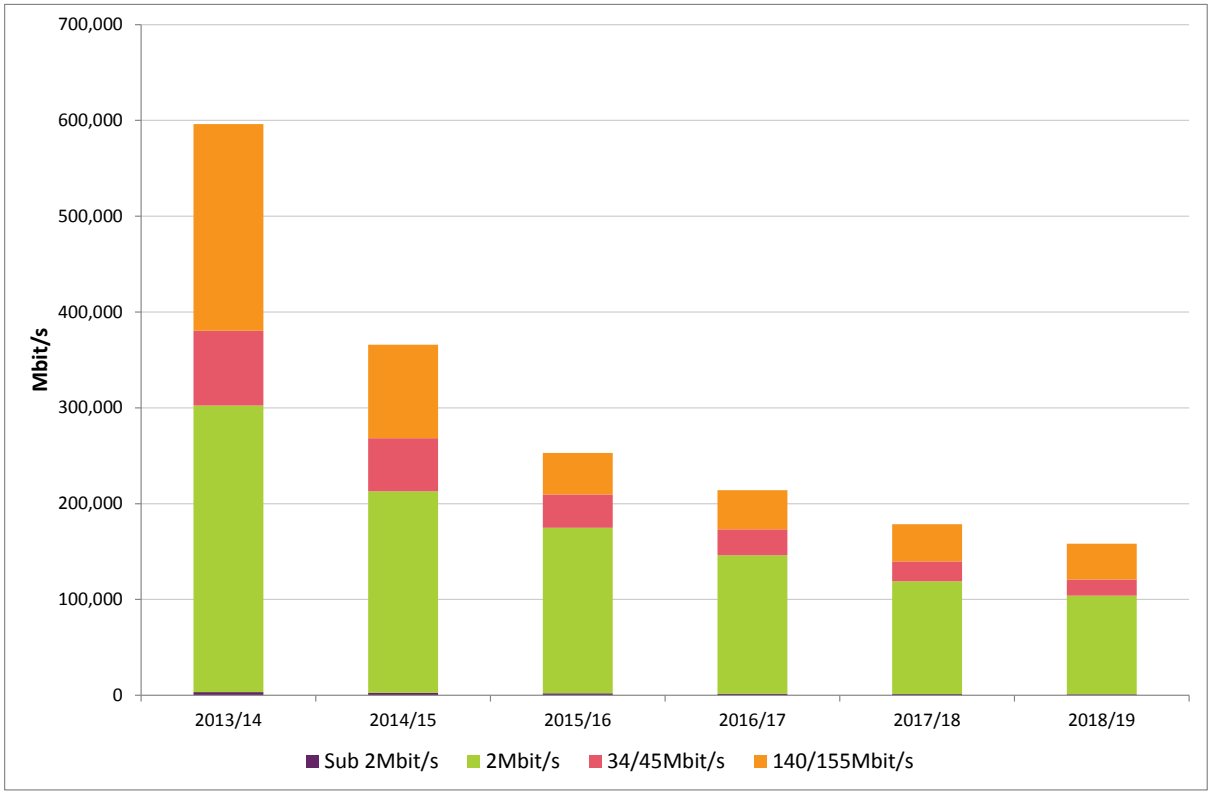
Source: Ofcom forecasts

A8.36 Figure A8.8 shows that sub-2Mbit/s and 2Mbit/s local ends currently make up the vast majority of all TI local ends, and this is forecast to continue as the higher speed TI services (34/45 Mbit/s and 140/155 Mbit/s) migrate to Ethernet-based services.

A8.37 We have also used our forecasts of local end volumes to derive a forecast of the capacity[169] that will be delivered over TI services over the next control period. As shown in Figure A8.9 below, our forecasts predict that capacity will decline rapidly from 2014/15 but is expected to decrease at a slower rate from 2016/17 onwards. This is consistent with our forecasts of local ends. The overall decline predicted in total capacity delivered through TI local ends – around 73% (or 23% reduction per annum) - is also similar to our volume forecasts.

[169] We multiply the local end volumes by the relevant bandwidths to derive our capacity measure.

Figure A8.9: Ofcom's forecast of TI services capacity



Source: Ofcom forecasts

Volume forecasts for Ethernet and WDM services

A8.38 We have followed two steps to establish our volume forecasts for Ethernet and WDM services. The first step is to forecast active-only circuits; we do this by carrying out the same analysis as we have for TI. The second step is to estimate how demand for Ethernet and WDM leased lines may be affected by the availability of the proposed dark fibre remedy. As a result, we derive two forecasts: one based only on active volumes and another that includes dark fibre volumes (plus the cannibalisation effect on the active volumes).

Key developments and trends in the market for Ethernet and WDM services

A8.39 As discussed in the May 2015 BCMR Consultation, Ethernet services now account for the majority of installed leased line circuits in the UK, with further growth forecast during the next charge control period.[170] We consider that the overall trend in demand for higher bandwidth Ethernet services over the next few years is likely to be driven by the following factors:

- increasing demand for bandwidth-intensive activities and applications;
- the need to transmit increasingly large amounts of data quickly;
- the deployment of NGA and new services delivered over 4G mobile networks (which will further increase the requirement for backhaul capacity); and

[170] Section 3, May 2015 BCMR Consultation.

- the lower unit cost of Ethernet by bandwidth, which is likely to drive further significant growth in the demand for Ethernet services.

A8.40 Within the broad category of Ethernet services, we expect there will be strong growth in services at 100Mbit/s and above but not for services up to 10Mbit/s. The latter is driven by two main factors:

- since the start of the current charge control period BT has charged similar prices for EAD 10Mbit/s and 100Mbit/s circuits, meaning that a significant number of customers have migrated to the higher bandwidth service; and

- the emergence of NGA and EFM services as an alternative to users that do not necessarily need very fast upload and download speeds or other features of leased lines.[171]

Accuracy of previous LLCC forecasts

A8.41 As with our analysis of TI volumes, we have assessed the accuracy of Ofcom's forecasts and the forecasts BT submitted as part of the 2013 LLCC for 2012/13 and 2013/14 in relation to Ethernet and WDM services. We also include a comparison of the 2014/15 volumes in BT's 2012 forecast with its current forecast for the same year, prepared in January 2015, as the outturn data were not yet available to us at the time of this consultation.

A8.42 We start by comparing BT's and Ofcom's 2012 forecast volumes with outturn for services of all bandwidths up to and including 1Gbit/s, as presented in Figure A8.10. We then carry out a similar assessment at a more granular level by comparing forecasts with outturns for circuits at 10Mbit/s, 100Mbit/s, 1Gbit/s and above 1Gbit/s. This is shown in Figure A8.11 through Figure A8.14.

Figure A8.10: Openreach's 2012 forecast, Ofcom's March 2013 BCMR Statement and outturn Ethernet service volumes, up to 1Gbit/s

[✂]

A8.43 For services up to 1Gbit/s, Openreach's 2012 forecast volumes were close to the outturn in 2013/14 (under-forecasting by approximately 5 thousand circuits or 3%). Similarly, Ofcom's 2012 forecast was close to outturn in 2013/14, although based on a slower growth than Openreach's (under-forecasting by approximately 11 thousand circuits or 7%).

A8.44 In the following charts we present our comparisons of forecast and outturn volumes by bandwidth. We start with 10Mbit/s and then consider 100Mbit/s and 1Gbit/s.

[171] See Annex 9, May 2015 BCMR Consultation.

Figure A8.11: Openreach's 2012 forecast, Ofcom's March 2013 BCMR Statement and outturn Ethernet service volumes, 10Mbit/s

[✂]

A8.45 For 10Mbit/s services, Openreach's 2012 forecast was above the outturn in 2012/13 and 2013/14 (over-forecasting by approximately 4 thousand circuits or 10%). As discussed above, this is likely to be driven by two factors. The first is a result of end-users substituting from 10Mbit/s fibre-based leased lines to EFM and NGA. The second factor is caused by BT setting EAD 10Mbit/s prices at a similar level to 100Mbit/s prices, which resulted in a significant proportion of end-users migrating from 10Mbit/s to 100Mbit/s services.

A8.46 Ofcom's 2012 forecast was also above the outturn in 2013/14 [✂] (over-forecasting by approximately 2 thousand circuits or 4%).

Figure A8.12: Openreach's 2012 forecast, Ofcom's March 2013 BCMR Statement and outturn Ethernet service volumes, 100Mbit/s

[✂]

A8.47 For 100Mbit/s services, Openreach's 2012 forecast was close to the outturn in 2012/13 and slightly below the outturn 2013/14 by approximately 2 thousand circuits or 3%). This is partly driven by the fact that a number of customers that previously purchased EAD 10Mbit/s services migrated to 100Mbit/s circuits following BT's decision to price the circuits at a similar level.

A8.48 Similarly, Ofcom's 2012 forecast was close to outturn in 2012/13 and slightly below the outturn in 2013/14.

Figure A8.13: Openreach's 2012 forecast, Ofcom's March 2013 BCMR Statement and outturn Ethernet service volumes, 1Gbit/s

[✂]

A8.49 For 1Gbit/s services, Openreach's 2012 forecast was again close to the outturn in 2012/13 and 2013/14. Ofcom's 2012 forecast had assumed a slower growth to 2013/14 but higher growth in 2014/15, thus forecast volumes were below outturn in 2013/14 (under-forecast by approximately 6 thousand circuits or 18%).

Figure A8.14: Openreach's 2012 forecasts, Ofcom's March 2013 BCMR Statement and outturn Ethernet and WDM service volumes, above 1Gbit/s (WES, BES, OSA/OSEA)

[✂]

A8.50 For services above 1Gbit/s Openreach's 2012 forecast was close to the outturn, with actual volumes in 2012/13 slightly lower than the previous year's forecasts.[172] Ofcom's 2012 forecast was based on a slower growth rate, thus forecast volumes were below outturn in 2013/14 (under-forecast by approximately 500 circuits or 13%).

A8.51 As with our analysis for TI services, it does not appear that the forecasts BT submitted in the 2013 LLCC were biased in a particular direction. Although Ofcom's forecasts were below actual outturns in 2012/13 and 2013/14, the overall difference was not large (less than 1% in 2012/13 and just over 5% in 2013/14). This is consistent with the analysis presented in Annex 5, which shows that differences between forecast volumes and outturns are not a key driver in explaining BT's relatively high rates of return for Ethernet services in 2013/14.

Analysis of Openreach's current forecast

A8.52 Openreach's current forecast is based on: an expected overall growth of Ethernet services; a shift of volumes towards higher bandwidths; and a gradual phasing-out of legacy Ethernet services (WES, BES). In terms of number of rental circuits, growth is forecast to be driven mainly by [✂]. The trend for these services is shown in Figure A8.15. The chart illustrates some significant differences in trends by product, for example [✂].

Figure A8.15: Openreach's forecast trend for rentals (EAD and EAD LA, 100Mbit/s and 1Gbit/s)

[✂]

A8.53 We have also analysed the trend for the relevant charging elements of Ethernet and WDM services (rental, main link, new connections) for all bandwidths. As presented in Figure A8.16, main links are predicted to grow at a relatively slower rate compared to circuits ([✂]). The number of new connections is forecast to remain relatively steady until 2015/16 and then decline to [✂] by 2018/19.

Figure A8.16: Openreach's forecast trend for charging elements of Ethernet services

[✂]

A8.54 We have also reviewed Openreach's current forecast for Ethernet and WDM services in the context of a longer-term historical trend. This is presented in Figure

[172] [✂].

A8.17 through Figure A8.20 for 10Mbit/s, 100Mbit/s, 1Gbit/s and above 1Gbit/s circuits.

Figure A8.17: Openreach's current forecast and historical trend (10Mbit/s)

[✂]

A8.55 Openreach's current forecast for 10Mbit/s that predicts a sharp decline from 2014/15, [✂].

Figure A8.18: Openreach's current forecast and historical trend (100Mbit/s)

[✂]

A8.56 Openreach's current forecast for 100Mbit/s predicts continuing growth [✂].

Figure A8.19: Openreach's current forecast and historical trend (1Gbit/s)

[✂]

A8.57 Openreach's current forecast for 1Gbit/s services broadly extends the historical trend of continuous growth over the entire forecast period, [✂].

Figure A8.20: Openreach's forecast and historical trend (above 1Gbit/s)

[✂]

A8.58 Similar to 1Gbit/s services, Openreach's forecast for above 1Gbit/s services predicts continuous growth. Given the relatively low volumes of services above 1Gbit/s, it is difficult to infer a forecast trend based on historical data. However, the path of fairly steady growth is broadly consistent with the historical trends observed for 100Mbit/s and 1Gbit/s services (when those services went from being relatively low-volume niche products to mass-market products).

Analysis of current forecasts of Openreach, OCPs and industry analysts

A8.59 We have received Ethernet and WDM volume forecasts from two industry analysts and seven operators.[173] These forecasts show a consistent pattern of market trends, though the rates of growth vary. Figure A8.21 through Figure A8.25 below compare the forecasts of these providers and analysts for circuits of specific bandwidths.

[173] Four of the operators we received forecasts from were able to forecast total volumes while the others forecast new connections.

Figure A8.21: Comparison of Ethernet circuits forecasts, up to and including 1Gbit/s

[✂]

A8.60 For all services up to 1Gbit/s, Openreach's forecast growth rate is slightly above IDC. It is somewhat below (although comparable to) the other industry forecast OVUM as well as [✂] and [✂]. [✂] forecasts steeper growth from 2015/16 onwards.

Figure A8.22 : Comparison of Ethernet circuits forecasts, up to 10Mbit/s

[✂]

A8.61 For 10Mbit/s services, Openreach forecasts a substantial decline of the rental volumes over the analysed period. IDC and OVUM also forecast a decline from 2016/17 and 2017/18, respectively, although at a much slower rate. [✂] expects the volumes to remain flat over the analysed period.

A8.62 In terms of data we have received on new connections, [✂] forecasts a decline to insignificant volumes by 2017/18 (fewer than 100). [✂] also expects a substantial decline by 2015/16 but expects the volumes to remain relatively stable thereafter.[174] [✂] expects a moderate growth over the same period.[175] None of [✂] forecast any volumes in the 10Mbit/s bandwidth.

A8.63 Given that Openreach continues to price EAD and EAD LA 10Mbit/s circuits at a similar level to 100Mbit/s circuits, we consider it reasonable to assume that its sales of these services will rapidly decline. The vast majority of new customers are likely to purchase 100Mbit/s services rather than 10Mbit/s (as they can get ten times the capacity for a similar price) while we expect existing 10Mbit/s customers to continue to upgrade their bandwidth or migrate to EFM and NGA.

Figure A8.23: Comparison of Ethernet circuits forecasts, 100Mbit/s

[✂]

A8.64 For 100Mbit/s services, the majority of CPs and analysts forecast a broadly consistent pattern of growth over the forecasting period. [✂].

Figure A8.24 : Comparison of Ethernet circuits forecasts, 1Gbit/s

[✂]

A8.65 For 1Gbit/s services, most CPs and analysts again forecast a broadly consistent pattern of growth over the analysed period, though in this case Openreach's growth

[174] [✂]
[175] [✂]

trend is slightly slower than most other forecasts. We also observe this for services above 1Gbit/s, as shown below, though in this case the difference between BT's forecasts and the two independent forecasts is larger (significantly so in the case of one forecast).

Figure A8.25: Comparison of Ethernet and WDM circuits forecasts, above 1Gbit/s

[✂]

A8.66 We have considered whether our forecasts of 1Gbit/s services and above should give more weight to Openreach's forecasts or the independent forecasts. In making this decision, we note that the forecasts we have received are not wholly comparable as the independent forecasts do not take account of circuits sold for backhaul use, whereas Openreach does. Similarly, as discussed above, we would expect variation in forecasts received from operators because Openreach provides services for a wide range of customers and uses (e.g. access and backhaul) whereas other operators often have narrower requirements, which means their sales and/or purchases are focused on a particular service or bandwidth.

A8.67 As noted above, our analysis of Openreach's previous forecasts indicate that they have not systematically under-forecast circuit volumes at 1Gbit/s and above. In fact, for both 1Gbit/s and above 1Gbit/s services, they have occasionally over-forecast volumes. We have also considered information received [✂].[176] This does not appear to be consistent with the possibility that Openreach is under-forecasting services at this bandwidth.

A8.68 Furthermore, we requested information from Openreach on new connections during the period 1 April 2014 to 31 December 2014 (i.e. the first 9 months of the 2014/15 financial year).[177] This shows that [✂]. This suggests that BT's forecasts for these services in 2014/15 are not significantly over- or understated.

A8.69 In light of the above evidence, we have therefore forecast Ethernet and WDM services at 1Gbit/s and above primarily based on Openreach's forecasts (and similar to [✂] forecast trends). As discussed above, given the independent forecasts are not capturing exactly the same services as Openreach, we would expect some differences.

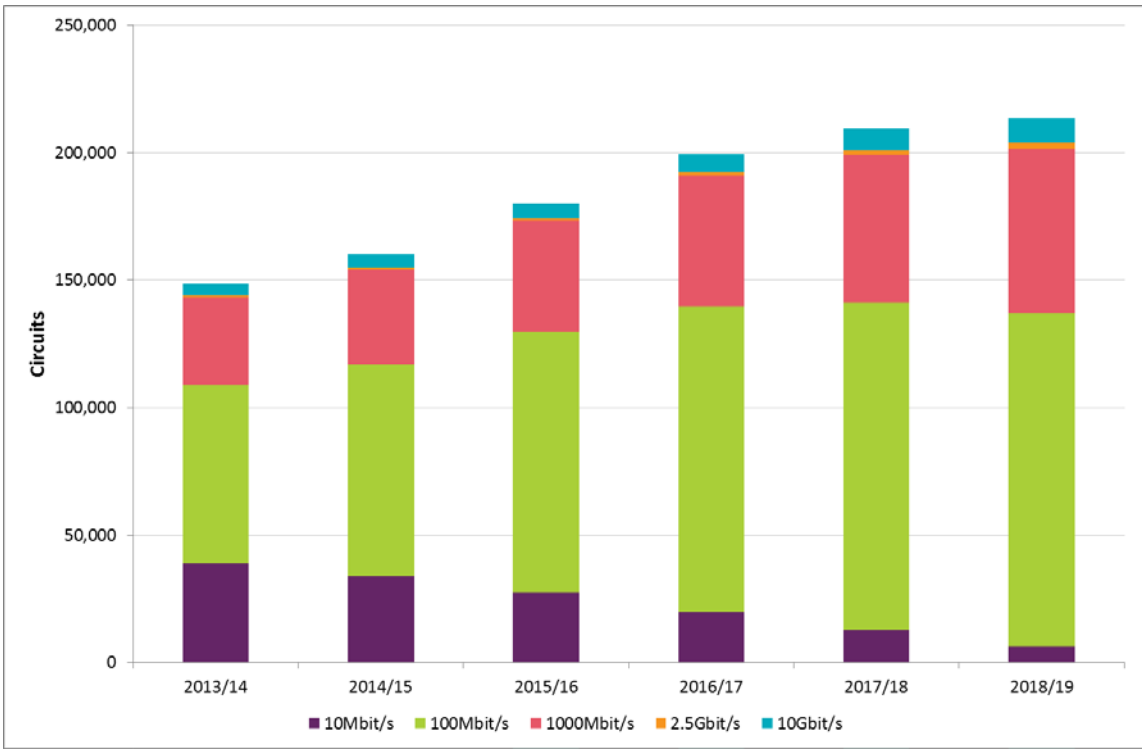
Ofcom's forecast of Ethernet and WDM service volumes

A8.70 Given the evidence and analysis presented above, we forecast significant growth in demand for Ethernet services, with the exception of 10Mbit/s services. Our forecast of total Ethernet circuit volumes is summarised in Figure A8.26 below.[178] By the end of this charge control, we expect the total number of Ethernet circuits to increase by around 45% compared to 2013/14 (or just less than 10% growth per annum). The majority of this growth is driven by 100Mbit/s and 1Gbit/s circuits, which are both forecast to grow by almost 90% by the end of the control (compared to 2013/14), which represents approximately 13% growth per annum. We also forecast circuits

[176] [✂].
[177] BT response dated 16 January 2015 to question B3 of the 8th s.135 notice dated 12 January 2015.
[178] In the chart, we have not included circuits with no identifiable bandwidth, for example OSA/OSEA bearer circuits and certain resilience circuits, and we have also not included bandwidths with significantly low volumes (for example 2Mbit/s, 155Mbit/s and 622Mbit/s).

above 1Gbit/s to account for a growing proportion of total volumes, with these circuits more than doubling by 2018/19.

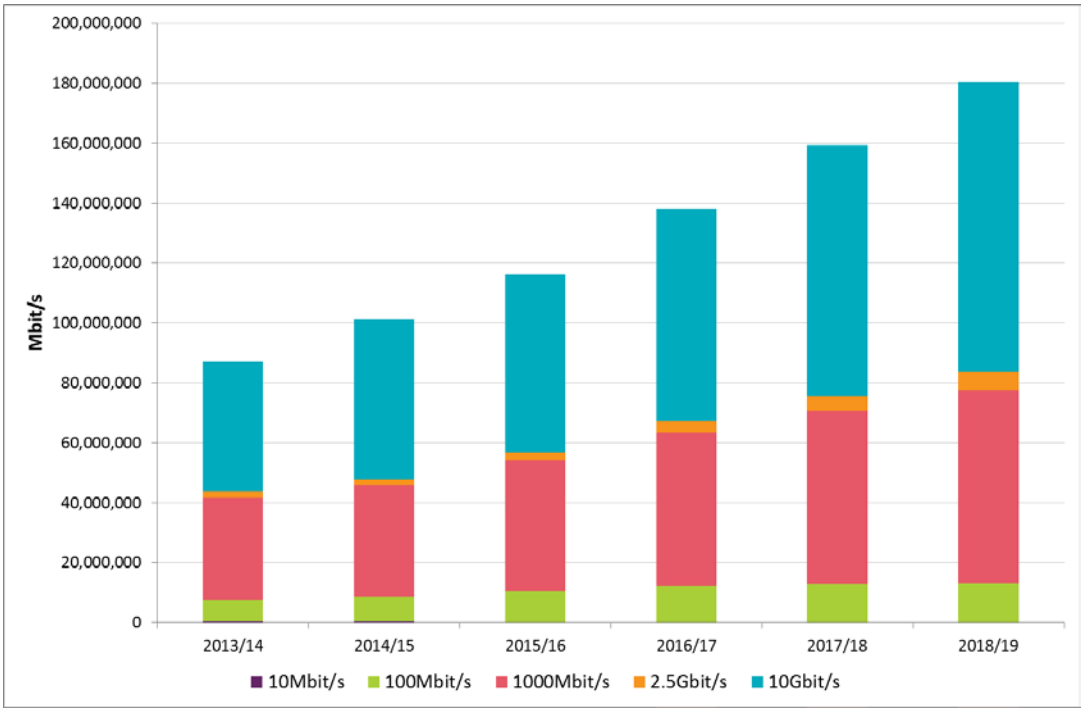
Figure A8.26: Ofcom forecast volumes for Ethernet and WDM services (number of circuits)



A8.71 With the increase in demand for Ethernet and WDM circuits, we also expect to see a significant increase in the capacity delivered over BT's network. This is illustrated in Figure A8.27 below, which presents the estimated capacity[179] growth implied by our circuit forecasts.[180]

[179] As for TI services, we have derived our measure of capacity by multiplying our forecast circuit volumes (split by bandwidth) by the corresponding bandwidth.
[180] As in Figure A8.26, we do not include circuits with an unspecified bandwidth or bandwidths of 2Mbit/s, 155Mbit/s and 622Mbit/s.

Figure A8.27: Capacity delivered by Ethernet and WDM circuits



Volume forecasts for dark fibre

Introduction

A8.72 As set out in Section 6, we need to adjust our active volume forecast to take into account the potential cannibalisation of active circuits by dark fibre in this review period.

A8.73 This adjustment is necessary for two reasons. First, we require it to reflect the relevant volumes of active circuits in the control. Second, we need it to forecast the appropriate level of costs to be recovered within the basket. We set out in Section 6 our proposed adjustment to costs to reflect the potential risk to cost recovery that arises from cannibalised active circuits and note that significantly underestimating cannibalisation may pose a risk to BT having an opportunity to recover its efficiently incurred costs by understating the costs that need to be recovered from the basket. However, we also note this risk needs to be traded-off against the potential risks of over-recovery from active circuits if we significantly overestimate the potential cannibalisation.[181]

A8.74 To estimate the cannibalisation of active circuits by the proposed dark fibre remedy, we have made some principles-based assumptions about the potential use of dark fibre, informed where possible by qualitative information from BT, OCPs and our proposed dark fibre remedy design. We recognise that in the absence of the full dark fibre proposals (including pricing, availability, migration terms etc.) to date, CPs' ability to forecast their expected use of dark fibre was understandably limited. Nonetheless, CPs have given us some indications of which circuits would switch to dark fibre which have informed some starting assumptions for the purposes of this

[181] This is because overestimating cannibalisation would result in a greater adjustment to the cost forecast in the charge control than was required (and therefore, all else equal, a lower value of X), and so could lead to higher active charges and significant over-recovery.

consultation.[182] We will however take stakeholder views on these proposed cannibalisation rates into account following this consultation, and would welcome views on our proposed underlying assumptions.

A8.75 Below we set out the underlying assumptions we have used to inform our proposed adjustments to the active volumes forecasts, before setting out what this means for different circuits types and our proposed cannibalisation rates.

Underlying assumptions

A8.76 First, we assume that dark fibre is introduced as proposed in Section 9 of the May 2015 BCMR Consultation (including that it is priced on a 1Gbit/s active minus basis), and that it is available from year two of this charge control period.

A8.77 Second, we assume that in their decisions to purchase dark fibre, CPs are responding to genuine market incentives and demands rather than arbitrage. This is on the basis that there will be consistency between active and dark fibre pricing approaches, such that density- and distance-based arbitrage opportunities are limited, and that BT rebalances its active charges for new connections/re-grades in order to remain competitive. Relatedly, we also consider cannibalisation of both internal and external sales of active circuits, on the assumption that BT will use dark fibre internally where there are benefits of doing so since it is likely to be responding to similar market demands and incentives as other CPs.[183]

A8.78 Third, we assume that there will only be cannibalisation of new connections (and associated rentals) in this review period (i.e. we assume no migration of pre-existing active circuits to dark fibre). Although we consider that migration of existing circuits is more likely to occur in the longer term (and BT has stated that [✂][184]), we consider there are other important considerations in relation to migrations in this review period which will limit the impact in this period.

A8.79 For example, existing circuits may be subject to contractual obligations in the shorter term, and there are also likely to be costs associated with any active circuit migration, which will affect the incentive to migrate circuits.[185] Costs could be both financial (e.g. if additional equipment needs to be purchased or there are early termination fees) and non-financial (such as service downtime/disruption). This, combined with the fact that dark fibre is a new remedy (and so is likely to take time to be proven effective) is likely to reduce the incentives proactively to seek to migrate existing circuits in this review period. In this regard, we note that some CPs

[182] Note, these significantly differ from the illustrative examples provided in the November 2014 BCMR Passives Consultation, as we are now in a position to reflect our specific passive remedy proposals, and for the purposes of the LLCC confine our assessment of potential cannibalisation to this review period.

[183] Virgin also noted in the context of the active charge rebalancing analysis set out in the November 2014 BCMR Passives Consultation that it is appropriate to assume that Openreach loses all internal and external sales of the relevant circuits, as BT's retail arm should be treated as having the same incentives as any independent third party CP when choosing whether to purchase an active or passive remedy (Virgin Media's non-confidential response to the November 2014 BCMR Passives Consultation, page 18). According to its internal analysis, BT expects downstream BT and other CPs to consider the use of dark fibre including scenarios where a significant number of its existing circuits would migrate to Dark Fibre (BT's response dated 24 March 2015 to question A1 of the 16th s135 notice dated 20 March 2015).

[184] [✂] However, this appears to be based on particular assumptions on the cost and process for migration, and does not seem to consider the costs in relation to migration of existing circuits which may pose a barrier in this review period.

[185] Several CPs ([✂]) referred to the restrictions from existing contractual obligations for active circuits as well as migration costs in their respective responses to our informal questions. [✂]

explicitly stated they would expect use of dark fibre to start with new connections,[186] and [✂][187]. We also note that the charging structure may affect the financial incentive to migrate existing active rentals. For example, OSA circuits currently have a relatively high connection charge, with relatively low rental charges (in comparison, EAD circuits have a relatively lower connection charge with higher rental charges). If this were to remain the case, once an existing OSA system is in place (and the connection had been paid for), it may be more cost-effective to continue to operate that system than to install a new system with new equipment using dark fibre.

A8.80 Relatedly, we understand that previous migration of existing rentals has typically taken time, even in the presence of financial incentives. For example, as discussed in Section 6, we understand that transition from legacy to new Ethernet services has taken place over two charge controls, and is expected to continue in this review period. This also suggests that there are likely to be wider considerations than pricing in the decision to migrate existing circuits, particularly in this review period.

A8.81 Conversely, we consider it is likely to be relatively more straightforward for CPs to use dark fibre for new connections (we discuss this further below).

A8.82 Therefore the evidence we have received suggests cannibalisation of new connections (and associated rentals) for this review period. We note that this may change in the future as dark fibre becomes more established.

A8.83 Finally, we propose to make an assumption that dark fibre will have no impact on total market size (i.e. the total number of circuits will be unchanged) in this review period. Although BT has argued that it would not simply be one for one migration (as both the volume of what CPs purchase and the pattern of their demand would change)[188] and [✂],[189] we consider it is not appropriate (and would be too speculative) at this stage to attempt to reflect this in our assumptions given our proposed remedy design. This is because we expect substitution of active circuits by dark fibre to be largely on a one-for-one basis in this review period due to the limited additional aggregation opportunities that are likely to exist with the proposed dark fibre remedy relative to active circuits (as discussed in Annex 25 of the May 2015 BCMR Consultation). Further, although we note that dark fibre may offer the potential to change network design in the longer term (which could undermine our one-for-one assumption), we consider that such major changes are likely to take some time (and so be beyond this review period). We also note that it has been suggested that the availability of dark fibre could increase the total market demand for connectivity,[190] but we consider that this effect is speculative at this stage, particularly for this review period.

Identifying active circuit types which might be cannibalised in this review period

A8.84 We first consider which circuits are likely to be commercially viable with dark fibre, as this will inform which type of active circuits may have some cannibalisation of new connections by dark fibre. While we recognise that there are likely to be a

[186] For example, TalkTalk stated that initial use of dark fibre is likely to focus on new/upgraded circuits rather than migrating existing circuits. Paragraph 7.10, TalkTalk's non-confidential response to November 2014 BCMR Passives Consultation. [✂]
[187] [✂]
[188] [✂]
[189] [✂]
[190] [✂]

range of factors which may affect the likely take-up of dark fibre by different CPs[191], in the absence of detailed information from CPs informed by the specific dark fibre proposals, we instead focus on broad inferences of commercial viability based on our remedy proposals for the purposes of consultation.

A8.85 Given the proposed pricing approach and design of a dark fibre remedy, we propose an assumption that all new EAD, EAD LA, and OSA connections at 1Gbit/s and above are likely to be commercially viable using dark fibre (even with active charge rebalancing). This is because they each provide a point to point dedicated fibre connection, as we expect dark fibre to do. Therefore we assume there may be cannibalisation of new active connections for these services by our dark fibre remedy.[192]

A8.86 Although EBD circuits offer bandwidth at 1Gbit/s or above, we are currently of the view that a single EBD circuit is unlikely to be replicated using dark fibre. This is because a single EBD circuit is an inherently different product to EAD/EAD LA type circuits (and therefore to a dark fibre) as it uses shared infrastructure rather than a dedicated connection.[193] Therefore at face value it is not clear a single EBD circuit would be economical to replace with a dark fibre, and so (partly as a result), it seems likely that a CP would need significant traffic which it can aggregate over the same connection to make it worthwhile. Therefore we would expect that if a CP is expecting to purchase a single EBD circuit rather than, for example, an EAD or OSA circuit, it is doing so for its particular characteristics, and so will likely continue to do so on the basis that it provides something EAD/OSA equivalents do not. Further, a large proportion of the EBD cost stack appears to relate to equipment costs [✂],[194] which may make the service costly to replicate using dark fibre. We also note that EBD is mainly purchased internally by BT, and so given the costs to provide EBD have already been incurred, BT may not overall (i.e. end-to-end) experience benefits from replacing EBD with dark fibre. As a result, we propose to assume no cannibalisation of EBD circuits.

A8.87 Given our pricing approach for dark fibre, we also propose an assumption that circuits below 1Gbit/s are unlikely to be commercially viable with dark fibre, and so do not assume any cannibalisation for these circuits. Similarly, given our view that Main Link would still be required with dark fibre, we do not consider any cannibalisation of Main Link.[195]

Estimating cannibalisation rates of active circuits

A8.88 Having identified the types of circuit likely to be viable with dark fibre, we need to consider what proportion of their forecast new connections may be cannibalised by dark fibre. For the purposes of this consultation, we consider it reasonable and

[191] [✂]
[192] Note we have not considered whether BES or WES circuits at 1Gbit/s and above are likely to be commercially viable since BES and WES connections are no longer available for sale at or below 1Gbit/s, so there will be no new connections for these services in this review period. At above 1Gbit/s BT is planning to launch EAD 10Gbit/s this year which is the strategy product alternative to WES/BES 10Gbit/s. We understand that volume forecasts for EAD 10Gbit/s are included in BT's forecasts for WES 10Gbit/s, and so for the purposes of simplicity at this stage we treat all of these as if they are EAD 10Gbit/s.
[193] Our understanding is that EBD involves using shared network infrastructure between two specific BT locations (from an ASN to an OHP), whereas a new EAD (and dark fibre) connection would involve a dedicated point to point fibre connection between a combination of end user sites, CP networks and sites and BT exchanges.
[194] Ofcom analysis based on BT's response to questions A6 and A8 of the 17th s135 notice dated 27 March 2015.
[195] [✂], but given the dark fibre pricing approach and our assumptions on Main Link, we consider that it is not clear that this would occur in this review period. [✂]

appropriate to assume 100% of new connections (internal and external) for EAD, EAD LA, and OSA circuits at 1Gbit/s and above will ultimately end up being cannibalised by dark fibre. We have adopted this assumption for this consultation for the following reasons.

A8.89 First, a large proportion of new connections for circuits at 1Gbit/s and above are likely to be purchased by larger CPs, with large existing businesses and experience in the market, for whom any barriers to using dark fibre are likely to be more limited. Indeed, many of these are also likely to be CPs who have strongly indicated their intentions to use dark fibre (and do so quickly). For example, [✂].[196] Similarly, [✂].[197]

A8.90 Second, bandwidths of 1Gbit/s and above are often used for backhaul, and so the flexibility over use and bandwidth arising from using dark fibre for backhaul is also likely to be valuable. This, combined with the fact that as discussed in Annex 23 of the May 2015 BCMR Consultation, there could be cost savings from using dark fibre rather than purchasing an active circuit for many new connections (i.e. in relation to reduced duplication of boxes), the incentives to use dark fibre for new connections rather than active circuits are likely to be higher.

A8.91 Third, given the balance of risk in terms of over- and underestimating the cannibalisation assumptions, we consider this provides a reasonable but conservative basis for the purposes of the charge control in these circumstances. This is particularly true given any potential overestimate here may be balanced by any potential underestimate as a result of our assumption for no migration of existing circuits.

A8.92 Therefore in the absence of a clear case to assume a lower level of cannibalisation of new connections at this stage, we propose to assume a 100% cannibalisation rate for the identified circuits. However, given this is a new remedy and will not be commercially available immediately, we would expect CPs to want to test and trial dark fibre before widespread adoption.[198] Therefore we would expect demand for dark fibre to be lower initially and grow over time. In recognition of this, we propose to reduce the cannibalisation assumptions in the expected first year of dark fibre availability (i.e. year two of the control), and so assume 50% cannibalisation of new active connections (and associated rentals) by dark fibre in year two of the control.

Proposed cannibalisation rates

A8.93 On the basis of the above, we therefore propose the following (cumulative[199]) annual cannibalisation rates (note, we assume cannibalisation of the rentals associated with the cannibalised connections). We would welcome stakeholder views on these proposed cannibalisation assumptions.

[196] [✂]
[197] [✂]
[198] For example, [✂]
[199] I.e. the year three volumes will reflect the combined cannibalisation effect from years one and two as well as the year three assumptions.

Figure A8.28: Proposed cannibalisation rates of active circuits

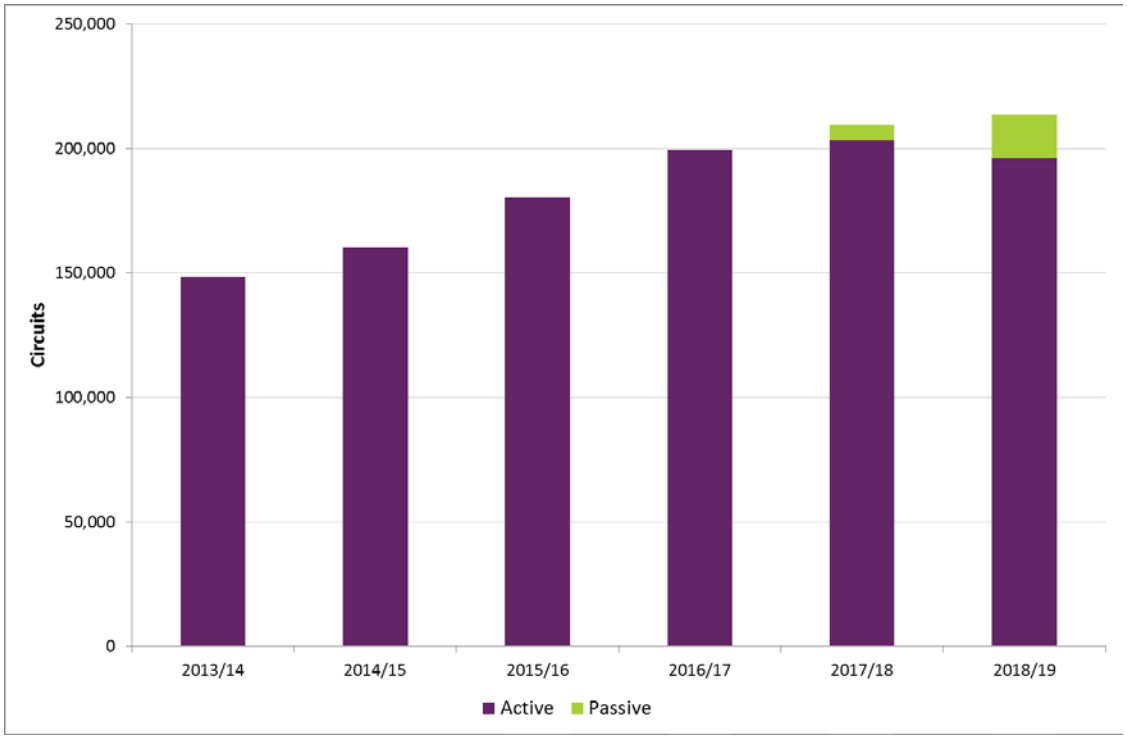
Service technology	Bandwidth	Customer type	Connection or rental	2016/17	2017/18	2018/19
EAD	1Gbit/s	Internal	Connection	0%	50%	100%
EAD	1Gbit/s	External	Connection	0%	50%	100%
EAD LA	1Gbit/s	Internal	Connection	0%	50%	100%
EAD LA	1Gbit/s	External	Connection	0%	50%	100%
OSA	10Gbit/s	Internal	Connection	0%	50%	100%
OSA	10Gbit/s	External	Connection	0%	50%	100%
EAD*	10Gbit/s	Internal	Connection	0%	50%	100%
EAD*	10Gbit/s	External	Connection	0%	50%	100%

**These are captured in model as WES Above 1Gbit/s services*

A8.94 By applying a cannibalisation rate to connections in a specific year, we are able to calculate the absolute number of new connections that year that are expected to be passive rather than active. We therefore reduce the active rentals by this amount. Furthermore, we carry this reduction forward into later years. For example, suppose in 2017/18 there were 100 new connections for a product and 1,000 rentals. Applying a 50% cannibalisation rate to new connections means that the number of active connections reduces to 50. We also reduce the number of rentals by this amount, such that they become 950 (we do not adjust main link forecasts as these will still be incurred under the dark fibre product). If in 2018/19 there were 200 new connections and 1,200 rentals forecast, then applying a 100% cannibalisation rate to new connections reduces the number of connections to zero and the number of rentals to 950 (minus 200 for the current year and we also carry forward the reduction of 50 from the previous year).

A8.95 Our forecast of Ethernet circuit volumes in the presence of dark fibre is summarised in Figure A8.29 below.

Figure A8.29: Ethernet and Passive Circuit Volume Forecasts



Asset and cost volume elasticities (AVEs/CVEs)

Introduction

A8.96 We would normally expect changes in volumes for services to have some impact on the costs and assets associated with providing those services. However, where a firm incurs fixed or common costs, costs may not change by exactly the same proportion as volumes. Therefore, when we forecast costs we need to appropriately reflect the underlying (sometimes complex) relationship between forecast changes in volumes and assets/costs.

A8.97 As set out in Section 4, the impact that forecast changes in volumes have on forecast costs in the 2015 LLCC Model (before taking into account efficiency improvements) is determined by CVEs and AVEs. Below we set out the methodology and analysis for deriving CVEs and AVEs. It is structured as follows:

- we start by explaining our rationale for using LRIC to FAC ratios;
- we then discuss the CVE and AVE estimates submitted by BT;
- we set out our assessment of BT's CVE and AVE estimates;
- we explain how we have produced CVE and AVE estimates based on revised LRIC model outputs; and
- we address comments from BT on adopting different elasticities for certain TI costs.

The use of LRIC to FAC ratios as a proxy for CVEs and AVEs

A8.98 As we set out in Annex 6, we propose to base our cost forecast modelling on component costs extracted from BT's regulatory financial reporting systems. Therefore, the relevant costs and volumes that the CVEs and AVEs[200] are applied to are the component costs and volumes. For example, to forecast pay operating costs for a particular component we use the following formula:

Pay(t) = Pay(t-1) * [1 – eff] * [1 + IPC(t)] * [1 + %volume change(t) * CVE]

where Pay (t) is the pay operating costs in the year t, 'eff' is efficiency, IPC(t) is the input price change in year t and CVE is the assumed pay operating cost CVE.

A8.99 The pay CVE for a component should be estimated to capture the extent to which pay operating costs for that component are expected to increase over the control period given the forecast change in component volumes, but holding all else (such as efficiency savings) constant. The equivalent is also true for non-pay operating costs[201] and (fixed) assets.[202] CVEs and AVEs should therefore capture the

[200] We do not use AVEs to estimate changes in net current assets; unit net current assets are assumed to remain constant (in real terms) over the control period, as shown in Annex 6.
[201] Note that non-pay operating costs exclude depreciation as it is separately modelled with the 2015 LLCC Model.
[202] For assets the AVE measures the extent to which asset volumes (measured at gross replacement cost) change with movements in component volumes. AVEs are therefore usually used to derive estimates of capital expenditure driven by changes in volumes.

marginal costs associated with the component volume change over the control period.

A8.100 In the short-run marginal costs can be lumpy, perhaps as a result of costs which are incurred when a particular level of output is reached, but then are fixed for a particular output range. For example, consider a product that requires one engineer for every one thousand lines to maintain those lines. For each line that exceeds a multiple of a thousand, a new engineer is required. Therefore, the short-run marginal cost for the (N*1000)+1 line will also include the cost of an additional engineer.[203]

A8.101 However, in the long-run, marginal costs are less lumpy as a result of inputs that, in the short-run, may have been fixed for certain output ranges being treated as fully variable and scalable. For the purposes of charge controls we focus on the long-run marginal costs, which therefore abstract from a degree of the lumpiness that may be observed in the short-run.[204]

A8.102 On this basis, the CVEs (and AVEs) are intended to effectively measure the long-run elasticity of total component costs with respect to changes in component output. Algebraically this can be expressed as:[205]

$$\mathrm{CVE} = \frac{\%\Delta \mathrm{LRTC}}{\%\Delta \mathrm{Q}}$$

where: $\%\Delta \mathrm{LRTC}$ is the % long-run change in total component cost, and $\%\Delta \mathrm{Q}$ is the change in total component volumes.

A8.103 Alternatively this can be expressed as:

$$\mathrm{CVE} = \frac{\Delta \mathrm{LRTC}/\mathrm{TC}}{\Delta \mathrm{Q}/\mathrm{Q}}$$

Or:

$$\mathrm{CVE} = \frac{\Delta \mathrm{LRTC}/\Delta \mathrm{Q}}{\mathrm{TC}/\mathrm{Q}}$$

A8.104 As $\Delta \mathrm{LRTC}/\Delta \mathrm{Q}$ is the long-run marginal cost ('LRMC') and TC/Q is average total cost (ATC), the CVE is equivalent to the ratio of the LRMC to the ATC:

$$\mathrm{CVE} = \frac{\mathrm{LRMC}}{\mathrm{ATC}}$$

A8.105 Granular information identifying BT's component level long-run marginal cost is not readily available. Ofcom has therefore historically used BT estimated CVEs and AVEs based on information from BT's LRIC model. Specifically, we have used BT information on the ratio of LRIC to FAC.[206] As the algebra above demonstrates, in

[203] Where N is an integer.
[204] While this long-run approach may imply that for certain points in time and levels of volume the modelled marginal cost exceeds the likely short-run marginal costs relevant to the control period, at other times the converse will be true. Therefore these impacts should mitigate to some extent each other over time.
[205] The algebra relates specifically to CVEs but it can also be applied for AVEs.
[206] Note that in this context we specifically refer to LRIC as opposed to DLRIC. BT's regulatory accounts historically have reported a 'LRIC floor'. However, this measure of costs relates to the so-called DLRIC cost concept. The distinction between LRIC and DLRIC is explained in BT's LRIC Model. In essence, DLRIC involves adding an element of fixed and common cost to the LRIC of a component. For the purposes of estimating CVEs

general, assuming that LRIC is a good proxy for LRMC, and FAC is a good proxy for ATC, then LRIC to FAC ratios can provide a good proxy for CVEs (and AVEs).[207]

A8.106 In the charge control model we forecast pay and non-pay operating costs separately. We therefore need to have separate CVEs for pay and non-pay operating costs. Historically one pay CVE and one non-pay CVE were applied to all components (or super-components) modelled by Ofcom. This was the case in the 2009 LLCC, for example. However more recently, including in the 2013 LLCC and the 2014 LLU/WLR charge controls, component-specific pay and non-pay CVEs have been adopted, thereby avoiding the need for averaging CVEs across components.[208]

A8.107 As discussed further below, although in principle AVEs could be calculated in the same manner as CVEs (i.e. separately for each component), the approach historically adopted by Ofcom has been to use BT estimated AVEs (based on information from the BT LRIC model) across a group of components for around a dozen asset types (e.g. duct, fibre, etc.).[209] These asset type AVEs have then been converted to component AVEs (within Ofcom's charge control modelling) by calculating component specific weighted averages of the underlying asset type AVEs, using a split of GRC by asset type as the component-specific weights.

BT's estimates of CVEs and AVEs for this charge control

A8.108 On the basis of our analysis above and consistent with our approach to CVEs and AVEs in recent BT charge controls (including the 2013 LLCC) we consider it appropriate to use:

- information on the relationship between LRIC and FAC from BT's LRIC model as the basis for our CVEs and AVEs. While we recognise that LRIC data may not be a perfect proxy for LRMC, we consider them to be the best available for setting this control; and

- data from BT's LRIC model for the same year as our base year financial information. BT's CCA FAC information is an important component of our base year financial data and a key input to BT's LRIC model. Therefore, we consider it desirable to use information from BT's LRIC model that is consistent with the base year data.

A8.109 We therefore asked BT for its estimates of the CVEs and AVEs for the components relevant to the charge control, including the workings for the estimates, for 2013/14.[210]

---

and AVEs, LRIC is therefore a more relevant cost measure than DLRIC as it provides a closer measure of the marginal costs that are of particular interest in the context of CVEs and AVEs.

[207] There may however be occasions where LRIC is not a good proxy for LRMC, for example where there are substantial increment-specific fixed costs. We investigated whether there were any such costs for leased line components but were not able to identify any.

[208] Or to be more precise super-component specific – BT's LRIC model does not contain information on individual components, but rather for super-components which are an amalgamation of a number of individual components. Therefore, references below to component information in relation to BT's LRIC model should strictly be taken as referring to super-components, rather than components, unless explicitly set out to the contrary.

[209] Asset types comprise of a number of relevant cost categories grouped together.

[210] Questions E1 and E2 of the first s.135. We also asked for the same information for the two previous years for comparison.

A8.110 BT's CVE estimates were generated based on the LRIC and FAC data for each of the relevant cost components. Both the LRIC and FAC data were extracted from BT's LRIC model tabulations.[211] FAC and LRIC information for individual components were built up from values for individual cost categories.[212] The LRIC for a component therefore is the sum of a series of LRICs for individual component and cost category combinations. These component LRICs for each cost category are driven by the cost-volume relationships (CVR) applied to each cost category.

A8.111 BT has explained that there are two types of cost category within the LRIC model:[213]

- **Independent categories** – where there is a direct relationship between cost and volume; and
- **Dependent categories** - where there is no direct relationship between cost and volume and LRIC 'depends' on the LRIC value of other cost categories elsewhere in the LRIC model.

A8.112 BT has further set out that "*BT has estimated the CVEs for the Components relevant to TI, AI and MI services using the Independent cost categories only…"Dependent" cost categories are not used because the LRIC values of these cost categories do not reflect a direct relationship between cost and volume...This approach is consistent with the methodology adopted in previous charge controls where calculations of CVEs were derived from BT's LRIC model*." [214]

A8.113 BT's AVE estimates were calculated on a different basis to CVEs. First, consistent with the approach in previous controls, the AVEs were estimated by BT on the basis of groups of assets rather than for individual components. Second, BT adopted a different approach to estimating the AVEs for the groups of assets. It explained that "*to calculate AVE values BT has used the CVR which describes the relationship between assets and volume for each asset cost category*". BT has set out that:

"*As with the calculation of CVEs, BT has used only Independent cost categories in estimating AVEs. BT has used the intercept of the CVR to identify the fixed costs, with the remainder of the CVR considered to be variable. This has enabled AVEs to be calculated using the equation AVE = (1 – fixed cost %).*

Where an Asset Cost Sector comprises several asset cost categories a weighted AVE is calculated. This requires the AVE of each Independent asset cost category to be combined in proportion to its share of the Asset Cost Sector's net replacement cost." [215]

A8.114 BT has also raised a number of points to note. These include:[216]

- "*There are a number of instances where the LRIC to Fully Allocated Cost (FAC) ratio is greater than 1.*

[211] Although FAC is an input to the model not an output.
[212] For more information on the operation of the LRIC model see BT, *Long Run Incremental Cost Model: relationships and parameters*, 15 August 2014, http://www.btplc.com/Thegroup/RegulatoryandPublicaffairs/Financialstatements/2014/LRICModelRelationshipsandParameters2014.pdf (BT's LRIC Model).
[213] Letter dated 13 October 2014 from Mike Fox (BT) to Marina Gibbs (Ofcom).
[214] Letter dated 13 October 2014 from Mike Fox (BT) to Marina Gibbs (Ofcom).
[215] Letter dated 13 October 2014 from Mike Fox (BT) to Marina Gibbs (Ofcom).
[216] We set out above why we consider LRIC to FAC ratios to be a relevant proxy for the underlying CVEs and AVEs.

- *There are a number of instances where the LRIC to FAC ratios are negative*."

A8.115 Although BT has provided no further explanation or detail of these instances, it has noted that "*The LRIC model was not created to produce CVEs or AVEs but rather to estimate LRIC values. The model calculates the costs of running a minimum network by applying 'scorched node and thinning' principles. Ofcom should therefore use this data with caution when applying it more generally in order to assess actual cost movements for relatively small changes in Component volumes.*"

Our assessment of BT's estimates of CVEs and AVEs

A8.116 As we explain below, we consider there are a number of aspects of BT's CVE and AVE estimates that could be improved upon:

- **the instances of unusual estimates** - we would normally expect to observe CVEs and AVEs in the range 0 to 1;

- **the exclusion of dependent cost categories** – BT estimated CVEs and AVEs on the basis of LRIC and FAC estimates for independent cost categories only on the basis that *"the LRIC values of these cost categories do not reflect a direct relationship between cost and volume*". However, the CVEs and AVEs that we are seeking to estimate reflect how total component costs change with component volumes, not only the changes that arise from direct volume relationships. We therefore consider that the dependent cost categories should be included in the estimates of CVEs and AVEs; and

- **the different approaches adopted for estimating CVEs and AVEs** – BT calculated AVEs and CVEs using different increments.[217] We recognise that the historical approach of relying on estimates for asset types rather than components may have contributed to this difference in estimation approach. However, in principle, CVEs and AVEs should be estimated using the same methodology, as set out above. Rather than using the LRIC to FAC ratios for components derived from the operating cost categories, as is used for CVEs, the AVEs could be estimated on the basis of the LRIC to FAC ratios for the components derived from the fixed assets cost categories. Given the potential for a loss of accuracy associated with aggregating asset types, and then disaggregating asset type AVEs to component AVEs, in our view adopting a consistent approach to estimating CVEs and AVEs is likely to be preferable to the approach adopted by BT.

A8.117 Other Ofcom projects have also identified issues with some of the outputs from BT's LRIC model. For example, in the charge control in the June 2014 FAMR Statement two of the CVEs that BT had provided were greater than one. [218]

A8.118 We therefore investigated where BT's estimates of AVEs and CVEs did not lie in the range 0 to 1. Our analysis focused on the 2013/14 (i.e. the base year for our charge control) LRIC model outputs that BT supplied to us as part of its Regulatory Financial Reporting. We identified that there were a number of individual cost

[217] CVEs were calculated using the LRIC to FAC ratios for the relevant components. When BT applied the cost volume relationship within its LRIC model the relevant volume decrease or increment was the relevant component volume. However when BT calculated AVEs it used a different increment; it effectively calculated the slope across all component volumes

[218] See, for example, paragraph A13.222, June 2014 FAMR Statement.

category and component combinations within the LRIC model that exhibit either negative LRICs, negative LRIC to FAC ratios or LRIC to FAC ratios above 1.

A8.119 We engaged with BT to understand how these unusual outputs had been generated by the LRIC model. The main cause appears to be the treatment of various credits in the LRIC model. Examples of such credits are the capitalisation of software development costs, rebates associated with Cumulo rates, or ECCs credits (these remove duct and fibre assets that were installed as part of ECC activity). However, although the costs associated with these credits are legitimate business costs, there were some issues with their treatment in the LRIC model:

- [✂]
- [✂]

A8.120 As a result, BT identified the need to make a number of amendments to the LRIC model and re-submitted its LRIC model AFI outputs for 2013/14. BT identified that it had made three broad types of changes to its LRIC model:[219]

- [✂]
- [✂]
- [✂]

A8.121 On the basis of our analysis into the causes of the unusual LRIC to FAC ratios, BT's changes appear reasonable.

Ofcom's CVE and AVE estimates on the basis of the revised LRIC model outputs provided by BT

A8.122 In light of the changes that BT has made to the LRIC model, we have used BT's revised LRIC model outputs to calculate our own CVE and AVE estimates.

A8.123 Our estimates are derived on the following basis:

- for each super-component relevant to our modelling of business connectivity services we have estimated a pay CVE, non-pay CVE and an AVE;
- the super-component estimates, which are as granular as we can estimate using the LRIC model outputs, are applied to each component within the super-component;[220]
- consistent with our approach in previous charge controls, we assume that our estimate elasticities remain constant over the charge control period;

[219] Initially provided on 25 February 2015 and confirmed in BT response provided on 20 March 2015 to question D1 of 17th s135 notice dated 27 March 2015.

[220] We intend to update our estimates of the relevant AVEs and CVEs for the final statement. Changes to the network component list in Annex 10 of the 2015 Directions for Regulatory Financial Reporting statement (Annex 10) generally increase the number of BCMR components. For example the Wholesale and LAN extension services fibre etc. super-component is the major network component used in AI services. In 2014/15 this will be replaced by four super-components. These new super-components were the main components that made up this super-component in 2013/14. We would therefore expect BT to provide more disaggregated LRIC and FAC data in 2014/15.

- the estimation of an AVE for each super-component is a departure from our historical approach which is based on AVEs for around a dozen asset types. As set out above, in previous controls BT would estimate AVEs for the asset types aggregating information from the LRIC model for the various cost categories relevant to the charge control. Component specific AVEs were then calculated in the charge control model using GRC weighted averages of the asset type AVEs. However, we can use the LRIC model outputs to directly estimate AVEs for each (super-) component using the equivalent methodology adopted for CVEs;

- our elasticity estimates are based on the component LRIC to FAC ratios from BT's LRIC model using the component totals of:

- non-pay operating cost categories (excluding depreciation cost categories) to estimate non-pay CVEs; [221]

    - pay operating cost categories to estimate pay CVEs; [222]

    - fixed asset cost categories to estimate AVEs;[223] and

- we have included both independent and dependent cost categories in our elasticity estimates for the reasons set out above.

A8.124 Based on this approach we have derived elasticity estimates for all the super-components relevant to business connectivity services. All of our super-component elasticity estimates are in the range of 0 to 1, as we would usually expect, with two exceptions:

- CO438 PC rental 2Mbit/s local end copper – the estimated AVE for this component is [✂]; and

- CO484 Ethernet main links – the estimated non-pay CVE for this component is [✂].

A8.125 We have investigated the cause of these anomalous results. Our analysis shows:

- CO438 PC rental 2Mbit/s local end copper - the result seems to be driven by large negative costs (both FAC and LRIC) for duct and fibre. No other BCMR components appear to have such large negative costs. We believe these have arisen from a capitalisation credit applied in 2013/14. Excluding these negative costs reduces the AVE to [✂] close to the value for "PC rental 64kbit/s link local end" (0.77), which we would have expected to have had a similar AVE. Although 2Mbit/s local ends are an important element of TI costs, the majority are fibre as opposed to copper. The CO438 (copper) super-component accounted for only 17% of the total GRC for the two (i.e. copper and fibre) 2Mbit/s local end components in 2013/14; and

- CO484 Ethernet main links - the result seems to be driven by large negative costs (both FAC and LRIC) related to Cumulo rates. In Annex 7 we note that we have revised allocations of BT's Cumulo rates in the base data for the charge control model to be consistent with our decision in the 2015 Directions for

[221] [✂]
[222] i.e. those cost categories with codes starting "PLOPPYZZ".
[223] i.e. those cost categories with codes starting "CEFA".

Regulatory Financial Reporting Directions statement. The impact of these changes is to correct these anomalous negative costs allocations, which occur largely as a result of BT s allocation of rebates. Excluding these negative Cumulo costs for Ethernet main links, reduces the non-pay CVE to [✂] close to the value for "Wholesale & LAN extension services fibre etc." (0.71), which we would have expected to have had a similar AVE. Although the Ethernet main links component has significant capital costs, it attracts very little non-pay operating costs (around 0.5% of the total for Ethernet components[224]).

A8.126 In light of the unusual nature of these two elasticities, we have used the estimated elasticities for the similar components we identify above as proxies.

A8.127 Our resulting CVE and AVE estimates for the super-components relevant to the 2016 LLCC are presented in Figure A8.30 below.[225]

[224] Based on the BT AFI data used for calculating the CVE and AVE estimates.
[225] In Figure A8.30 we focus on the 39 super-components that are relevant to the 2016 LLCC. Our analysis and modelling relates to 65 super-components, but we have excluded from Figure A8.30 any super-components that either have no leased lines costs forecast during the control period (i.e. 1 April 2016 to 31 March 2019), or are used by non-charge controlled services (e.g. 34/45Mbit/s TI services).

Figure A8.30: Our CVE and AVE estimates for the super-components relevant to the 2016 LLCC

	Super-component	AVE	Pay CVE	Non-Pay CVE
CO417	64kbit/s PC link connection cct provision	0.79	0.98	0.81
CO418	64kbit/s PC link connection cct rearrangements	0.79	0.98	0.81
CO432	PC rental 64kbit/s link local end	0.77	0.90	0.77
CO381	PC rental 64kbit/s link	0.71	0.85	0.74
CO391	PC rental 64kbit/s link per km transmission	0.38	0.80	0.81
CO413	2Mbit/s and above PC link connection cct provision	0.79	0.97	0.85
CO438	PC rental 2Mbit/s local end copper	0.77	0.95	0.79
CO439	PC rental 2Mbit/s local end fibre	0.38	0.70	0.77
CO383	PC rental 2Mbit/s link	0.82	0.90	0.75
CO371	PC rental 2Mbit/s link per km distribution	0.36	0.82	0.84
CG101	PC rental 2Mbit link per km regional trunk	0.29	0.78	0.78
CG201	PC rental 2Mbit link per km national trunk	0.33	0.79	0.78
CL139	Local Loop Unbundling systems development	0.89	0.91	0.88
CL161	MDF Hardware jumpering	0.79	0.97	0.87
CL171	E side copper capital	0.23	0.62	0.72
CL172	E side copper current	0.79	0.43	0.79
CL173	D side copper capital	0.23	0.65	0.58
CL174	D side copper current	0.79	0.53	0.76
CL175	Local exchanges general frames capital	0.31	0.79	0.75
CL176	Local exchanges general frames current	0.80	0.15	0.79
CL177	PSTN line test equipment	0.57	0.31	0.85
CL178	Dropwire capital & PSTN NTE	0.99	0.93	0.61
CL180	Residential PSTN drop maintenance	0.79	0.97	0.89
CO187	Broadband line testing systems	0.52	0.69	0.85
CO379	Point of Handover electronics	0.52	0.88	0.84
CO401	NetStream equipment	0.86	0.86	0.86
CO506	SG & A partial private circuits	0.87	0.90	0.94

CP502	Sales product management	0.82	0.96	0.90
CD999	Notional Debtors	0.00	0.00	0.00
CL501	Service Centres - Provision	0.86	0.76	0.91
CL503	Service Centres - Assurance	0.86	0.79	0.91
CL160	Routeing & records	0.81	0.96	0.77
CE104	AISBO Excess Construction	0.02	0.00	1.00
CN013	21CN Backhaul Link & Length	0.57	0.74	0.83
CO447	Backhaul extension services fibre etc.	0.06	0.41	0.68
CO450	Wholesale & LAN extension services fibre etc.	0.20	0.46	0.71
CO484	Ethernet main links	0.21	0.86	0.71
CO485	Ethernet Electronics	0.96	0.89	0.90
CT454	Wholesale & LAN extension services BNS	0.06	0.43	0.68

Source: Ofcom analysis of BT's LRIC model outputs

Adopting different elasticities for certain TI costs due to the decline in TI volumes

BT Wholesale's representations

A8.128 BT Wholesale has made representations to us on changes it considers should be made to the treatment of assumed elasticities with respect to certain TI cost items. [226]

A8.129 BT Wholesale's arguments relate to its accommodation and core transmission costs.[227] It considers that BT is unable to reduce costs as rapidly as is indicated by the AVEs and CVEs derived from BT's LRIC model, as it cannot remove certain transmission equipment until the last circuit that uses the equipment is ceased. It therefore will not be able to reduce costs in response to a volume decline in the short term.

A8.130 To support its arguments BT Wholesale provided some analysis it had undertaken (separately) in relation to PDH and SDH equipment for the period 2011/12 to 2013/14. [228] It examined how volumes of private circuits, muxes, footprint and power consumption changed over the period. BT Wholesale has argued that this analysis shows that:

- for PDH, the change in muxes, footprint and power consumption were less than half the decline in private circuit volumes. This is the result of the "PDH

[226] Presentations titled *Elasticities for Accommodation: TI Markets (including Point of Handover and Wholesale Regional Trunk Segments)* sent to Ofcom on 2 December 2014 and *Leased Lines Charge Control: Elasticities for Accommodation in TI Markets* dated 23 January 2015.
[227] Specifically those in relation to its accommodation plant network (DF) and core transmission (DA) asset sectors.
[228] PDH is used to support Kilostream services and SDH is used to support Megastream services.

compaction programme" undertaken by BT. Therefore, the AVE/CVE for 64Kbit/s (which uses PDH) is 'in line with' those submitted to Ofcom by BT; and

- for SDH, there has been no reduction in footprint, mux count and power-usage despite a 35% decline in private circuit volumes. BT argues that this is because transmission equipment cannot be removed until the last circuit is terminated. Therefore, the AVE/CVE for 2Mbit/s and above (which uses SDH) are 'much lower' than those submitted to Ofcom by BT

A8.131 As a result of this analysis, BT Wholesale has amended its submission in response to our formal information request in relation to its CVE and AVE estimates.

Our response

A8.132 BT Wholesale made similar arguments in relation to CVEs and AVEs as part of its submissions to the 2013 LLCC. In the 2013 LLCC, we rejected the arguments on the basis that, while there might be some merit in the views put forward, we did not think that they were applicable in general and we expected that any lumpiness in costs would be smoothed out over the longer term.

A8.133 We recognise that the rapid decline in demand for TI services covered by this control period requires careful thought when designing the charge control model. In Annex 6 we explain how we have adjusted our typical modelling approach to forecasting BT's costs to take the rapid decline in demand for TI services into account.

A8.134 However, we continue to consider that that it is not appropriate to adjust our CVE and AVE estimates to reflect the arguments put forward by BT. We explain above that in setting the charge control our focus is on forecasting how changes in volumes affect BT's costs in the long run. Our modelling therefore deliberately abstracts from short run lumpiness in costs. At times this can act to BT's advantage, while on other occasions it may not, but we seek to ensure it is not biased in either direction.[229] We therefore recognise that BT may not be able to remove some transmission and accommodation costs as smoothly as TI volumes decline in the short-run[230] but we do not aim to capture such short term lumpiness in our cost forecasts. As we noted in the 2013 LLCC statement we would expect such lumpiness would be smoothed out over the longer term.[231]

A8.135 Notwithstanding these more conceptual concerns, we also have some concerns in relation to the robustness of the analysis presented by BT. As we understand it, BT's analysis looks at how total equipment counts, footprint area and power consumption have varied compared to the decline in private circuit volumes. However, particularly in relation to SDH transmission equipment, private circuits are not the only services that use the transmission assets considered by BT. Furthermore, as demand for other networks decline, it may be that network traffic is diverted onto the SDH network. Therefore, focusing on the relationship between total costs and only private circuit volumes may risk overstating the 'stickiness' of the costs, particularly in relation to SDH. Conversely, the construction of the cost-volume relationships that underlie the LRIC model seeks to avoid such risks.

[229] In part by minimising departures from our typical approach, such as those argued for by BT Wholesale in this case.
[230] Although the reductions in PDH costs from BT's 'compaction programme' show that cost reductions can be made in relation to at least some transmission equipment.
[231] Paragraph 19.278, March 2013 BCMR Statement.

A8.136 Finally, although there are a number of potentially reasonable ways to estimate average elasticities across the various super-components potentially relevant to the 2016 LLCC, our analysis suggests that the weighted average AVEs for BT Wholesale services as supplied by BT in October 2014 are materially higher than those used in the 2013 LLCC (i.e. around 0.6 compared to around 0.5). Therefore, to the extent that BT Wholesale's concerns in relation to TI services are motivated by the apparently significantly higher elasticity estimates, we note that our estimates are on average closer to those used in the March 2013 BCMR Statement than those estimated by BT in October 2014 (our weighted average AVE for TI components is around 0.5). Furthermore, as we discuss below, the analysis we have carried out of BT's profitability in 2013/14 suggests that using our revised CVE and AVE estimates produces results that are reasonably consistent with BT's recent financial performance.

We propose to base the 2016 LLCC cost forecasts on our estimates of the relevant CVEs and AVEs for this control

A8.137 On the basis of the reasoning set out above, we propose to base the 2016 LLCC cost forecasts on our estimates of the relevant CVEs and AVEs for this control as set out in Figure A8.30 above. We propose to assume that these elasticity estimates will remain unchanged over the forecast period. Our estimated CVEs and AVEs relate to super-components, but our modelling is carried out at the component level. Therefore we also propose to assume that each component has the same elasticities as the super-component to which it comprises.

A8.138 In Annex 5 we present our analysis of BT's profitability in 2013/14 and the factors that may have contributed to the divergence between BT's outturn profitability in business connectivity markets in 2013/14 and that which we forecast when setting the 2013 LLCC. We show in this analysis that had our latest CVEs and AVEs been adopted for the 2013 LLCC modelling, our forecasts for both TI and Ethernet profitability would have been closer to outturns for 2013/14. On this basis it also appears that our latest CVE and AVE estimates appear to be reasonable, and potentially an improvement on those adopted in the 2013 LLCC.

Efficiency

Introduction

A8.139 As set out in Sections 6 and 7, in calculating the appropriate value of X for the charge control, we take into account an assumed efficiency gain that we expect BT to be able to achieve over the period of our proposed charge control.

A8.140 Assessing efficiency requires a degree of regulatory judgement. Our analysis is heavily dependent on the available evidence. For this charge control we have analysed several different sources of data, each of which have their own advantages and disadvantages. We have used the same evidence when assessing efficiency improvements for both Ethernet and TI services, though we have assessed the impact for each set of services separately.

A8.141 Our proposal is to adopt an efficiency assumption of between 4-7% with a base case estimate of 5% for both Ethernet and TI services. Within the 2015 LLCC Model we apply this rate to both operating costs and capital expenditure.

A8.142 In this section we first define what we mean by efficiency gains and then provide an overview of our approach. We then review each of the different sources of evidence before presenting our provisional conclusions.

Definition of efficiency gains

A8.143 The rate we are trying to establish for the purpose of forecasting BT's efficiency gains is a rate that:

- is applied to cash payments. This covers all operating costs, excluding depreciation, plus capital expenditure;
- is independent of volume effects and input price changes;
- captures the effect of all means of delivering efficiency savings including the savings that might be achieved by doing things less often (e.g. through reduced fault visits) or more quickly (e.g. through reduced task times); and
- is stated with reference to the overall reduction in cash costs i.e. it takes into account any additional costs incurred in delivering those efficiencies.

A8.144 We apply our efficiency rate to each and every year between our base year in this consultation (2013/14) and the last year of the charge control (2018/19).[232] We are therefore estimating the average annual efficiency rate over this period.

A8.145 In previous charge controls we have sometimes analysed efficiency in terms of two separate components: 'catch up' and 'frontier shift'.[233] The evidence that we have considered for this charge control does not generally allow us to make this distinction but for the avoidance of doubt our efficiency estimates include both these components.

A8.146 Our efficiency measure is independent of input price changes and so can be thought of as a measure of BT's total factor productivity over time. For a given level of output, it captures how much inputs can be reduced, ignoring input price changes.

A8.147 The way in which the efficiency rate is used within the 2015 LLCC Model is described in Annex 6. It is applied separately to both pay and non-pay operating costs and to both steady state and additional capital expenditure for network components. For example the operating costs for a component in any year are derived from the previous year's costs for that component by applying the relevant CVE to the component volume growth as well as the relevant inflation rate and the efficiency assumption. The costs for steady state capex are calculated in a similar way from the previous year's capex but with no reference to volume changes. Growth capex is calculated using a formula that is similar to that for operating costs but relates to previous year's gross replacement costs rather than the previous year's gross capex.

[232] We intend updating the LLCC models for the 2016 BCMR Statement using base data from BT's 2014/15 RFS. If and when we do then we will apply our efficiency rate over the period 2014/15 to 2018/19.
[233] 'Catch up' is the change in costs required to bring an operator in line with an efficient operator. 'Frontier shift' is the movement in efficiency expected by an efficient operator over time.

A8.148 The formulae in Annex 6 highlight the interrelationship between inflation, cost and asset volume elasticities and efficiency and the need to consider all four together and consistently.

Summary of our approach

A8.149 To establish our efficiency assumptions we have:

- reviewed the efficiency assumptions that we have adopted in other recent charge controls and considered their relevance for these controls;
- analysed regulatory accounting information over the last few years. We have analysed movements in component costs using the cost forecasting formulae within the 2015 LLCC Model described above;
- analysed both historical and forecast BT management accounting information that identifies cost transformation and efficiency targets for various BT divisions;
- assessed efficiency gaps identified for BT by an independent benchmarking study; and
- reviewed other public information about BT cost performance such as public statements made by BT itself and brokers' and analysts' reports.

A8.150 Below we review each of the above before setting out our overall proposals.

Recent Ofcom efficiency assumptions

A8.151 Past decisions provide a context and a base from which to assess our efficiency proposal for this review. The efficiency assumptions we have adopted in recent fixed telecoms charge controls are summarised in Figure A8.31 below.

Figure A8.31: Efficiency assumptions used in recent telecoms charge controls

Charge control	Efficiency assumption	Charge control Period covered	Comments
March 2013 BCMR Statement: TI services	1.5%[234]	2013/14 - 2015/16	Applied to operating costs only Based largely on estimates of BT Wholesale's efficiency
March 2013 BCMR Statement: Ethernet services	4.5%[235]	2013/14 - 2015/16	Applied to operating costs and capital expenditure Based largely on estimates of Openreach's efficiency
July 2014 WBA Statement	5.0%[236]	2014/15 - 2016/17	Applied to operating costs only Based largely on estimates of TSO's and BT Wholesale's efficiency
July 2014 FAMR Statement	5.0%[237]	2014/15 - 2016/17	Applied to operating costs and capital expenditure Based largely on estimates of Openreach's efficiency.

A8.152 We make two observations on the relevance of these for the 2016 LLCC. These relate to the BT divisions that contribute costs to business connectivity services and to BT's recent financial performance.

A8.153 The above figure shows we have largely based our previous assumptions on efficiency estimates for individual BT divisions. In the March 2013 BCMR Statement, the TI efficiency rate was based heavily on estimates of BT Wholesale's efficiency; the Ethernet efficiency rate was based on estimates for Openreach.[238]

[234] See paragraphs 19.233 to 19.248, March 2013 BCMR Statement.
[235] See paragraphs 20.318 to 20.353, March 2013 BCMR Statement.
[236] See paragraphs A7.191 to A7.197, June 2014 WBA Statement.
[237] See paragraphs A16.101 to A16.111, June 2014 FAMR Statement.
[238] See paragraphs A12.73, March 2013 BCMR Statement.

A8.154 For this consultation, BT has provided information that shows which of its divisions contributed costs to the various LLCC markets.[239] This shows that in 2013/14 BT Wholesale accounted for relatively few costs ([✂]) for TI services (and [✂] for Ethernet services). However, BT's TSO division accounted for a significant proportion of costs for both TI ([✂]) and Ethernet ([✂]) services. TSO owns, maintains and supports the electronic equipment used by both Ethernet and TI services; it purchases electricity on behalf of BT Group and it is also responsible for systems and software development. Openreach accounts for most of the remainder: [✂] for TI and Ethernet services respectively..

A8.155 For the 2016 LLCC we propose to reflect these revised views of cost coverage within our assessments. We believe, where evidence exists, that it is no longer appropriate to base the TI efficiency rate on estimates of BT Wholesale efficiency alone. Rather we should also consider the potential contributions from Openreach, TSO and BT Wholesale for both Ethernet and TI services. We discuss this further in paragraphs below when we describe our analysis of historical and forecast BT management accounting information.

A8.156 Openreach, TSO and BT Wholesale account for the vast majority of costs in both TI and Ethernet markets. The June 2014 FAMR Statement and the June 2014 WBA Statement adopted a 5% efficiency assumption based on the costs of these three divisions. This therefore suggests that 5% provides a reasonable base for our assessment of efficiency for the 2016 LLCC.

A8.157 This is also supported by our assessment of BT's financial performance. In the 2013/14 financial analysis we have completed (set out in Annex 5), we note that BT has earned a return on capital that is significantly in excess of what we expected when we set the 2013 LLCC. Returns in TI markets in 2013/14 were higher than they were in Ethernet markets.

A8.158 We have re-run the 2013 LLCC Model updating the efficiency assumption to be 5% for both TI and Ethernet Services, consistent with that adopted in other recent change controls. When combined with updates to other assumptions, which we explain in Annex 5, this produces an outcome closer, to BT's actual 2013/14 performance.[240] This provides some support for the view that BT's actual improvement in efficiency for both Ethernet and TI services has been higher than we had previously forecast.

Analysis of regulatory cost accounting information

A8.159 We used BT's historical network component costs underpinning BT's Regulatory Accounts to estimate BT"s historic efficiency relevant to the LLCC. By using the formulae used in the 2015 LLCC Model, we accounted for year on year changes in costs in terms of efficiency, inflation and volume. To estimate cost volume movements we used CVEs from the 2015 LLCC Model where available (i.e. for components in current use). For components no longer in use we used an average CVE.[241, 242] We assumed that inflation was the average CPI[243,244] for the relevant

[239] BT, Response to 1st s135 notice dated 7 August 2014, responses to questions F3 and follow –up questions A1-3 to Question F3 in the 1st s135 notice dated 10 March 2015.
[240] See Annex 5 for more details.
[241] We tested this assumption and it did not materially alter the results of the analysis.
[242] There were some components that were either introduced or ceased in one of the years of the period under review, i.e. volume in one of the years was zero. Where this happened we excluded the component's results by assuming a CVE of 1.

year. Efficiency was assumed to account for the remaining movements in costs once volume and inflation driven cost movement had been accounted for.

A8.160 There are some practical issues with this analytical approach.

A8.161 First, there have been changes in the way costs have been attributed within BT's regulatory accounting system and in the way they have been reported. New components have been introduced and attributions to components have also been affected by the introduction and growth of new services. Hence, there may be other reasons why costs will change from year to year apart from inflation, or changes in volume or improvements in efficiency.

A8.162 In our analysis we have attempted to mitigate the effects of some of these changes by undertaking a set of "pairwise comparisons". Each year's RFS includes costs for two years, the latest year and the prior year. In each RFS costs in the prior year may be re-stated if there have been major methodological changes that have been introduced in the latest year. To take advantage of any restatements we have therefore compared the results for the two years reported in each RFS. However, this will not necessarily remove all the inconsistencies. BT does not restate results for relatively small changes in methodology and is not able to restate results if, for example, there have been changes in data sources.

A8.163 The second issue concerns the availability of relevant data. The 2015 LLCC Model formulae are used to forecast pay and non-pay operating costs and steady state and growth capex. Ideally, we would use BT's published RFS results for this analysis but the data is not detailed enough to support the analysis we need to undertake. For example cost and volume data are only reported for super-components rather than components,[245] operating cost data includes HCA depreciation, and there is no information published on capex. However, BT's regulatory accounting system (which holds the underlying accounting information and from which the RFS are prepared) does hold pay and non-pay cost information by component. It also holds some limited capex information but we understand that this is not broken down into steady state and growth components.

A8.164 Given the above our analysis is based on volume and operating cost information provided by BT for the purpose of this review for network components used by business connectivity services over the period 2009/10 to 2013/14. [246] This provides four sets of comparisons: 2009/10 with 2010/11, 2010/11 with 2011/12, 2011/12 with 2012/13 and lastly 2012/13 with 2013/14. We have estimated operating cost movements using combined pay and non-pay costs. [247] We have not analysed depreciation or mean capital employed. The analysis we have undertaken therefore provides no specific evidence on capex efficiency.

A8.165 We have also excluded the following components from our analysis:

---

[243] We do not believe this is a critical assumption. Within the 2015 LLCC Model our overall forecast inflation estimate (based on specific inflation assumptions for different types of costs) is very close to the forecast CPI.
[244] We estimated annual inflation by calculating the percentage change in the 'average CPI' from one year to the next. The 'average CPI' was estimated as the average of the 12 month end CPI values for the year ended 31 March. CPI data was sourced from CPI All items (D7BT), table 6a, http://www.ons.gov.uk/ons/datasets-and-tables/index.html?pageSize=50&sortBy=none&sortDirection=none&newquery=monthly+cpi&content-type=Reference+table&content-type=Dataset
[245] See Annex 6 for further discussion on the difference between components and super-components.
[246] BT response to 1st s135 notice, response to question H12.
[247] We not believe this is a critical assumption given the results we present later and because inflation and CVEs are similar for both pay and non-pay costs.

- Access cards (Other services) components as the costs for these components have been excluded from 2015 LLCC Model;[248]

- administrative components such as sales product management and SG&A Private circuits as the 2015 LLCC Model forecasts the costs of these using service volumes rather than component volumes;[249] and

- components where the volume measure was inconsistent across years. This adjustment applied to only a small number of components.

A8.166 For each component in each of the four years for which we have "pairwise comparisons" we have calculated the implied efficiency using the cost and volume data above and our CVE and inflation assumptions. We have then estimated efficiency improvements for TI and Ethernet services separately by weighting the component results by the total TI services' and Ethernet services' operating costs for that component.

A8.167 The results of this analysis are given in Figure A8.32 below.

Figure A8.32: Efficiency estimates of Operating Costs from analysis of Regulatory Cost Accounting data

	2010/11 to 2013/14 (Average pa over 5 years)	2011/12 to 2013/14 (Average pa over 3 years)
TI	2.0% pa	3.0% pa
Ethernet	8.0% pa	10.5% pa

Source: Ofcom analysis

A8.168 The above results have been smoothed by taking averages over either all four or just the last two "pairwise comparisons". In practice there was quite large variation in the results with negative results (i.e. implying inefficiency) in some years. Nevertheless these suggest that there have been historic efficiency gains of around 3% pa on TI services and up to 10.5% on Ethernet services in recent years. We also take some comfort that the results over the last three years are broadly consistent with our analysis of BT's profitability mentioned above.

A8.169 Although this is historical evidence relating only to operating costs it does calculate efficiency and take account of changes of volumes consistent with how costs are forecast within the 2015 LLCC Model. The year on year variability in the results however means we give this evidence low weight in our final proposals.

Analysis of BT's historical and forecast management accounting information

A8.170 In previous charge controls we have analysed historical and forecast "PVEO" analyses of management accounting data for various BT divisions. These PVEO analyses are used by BT in the management of its business and, therefore, provide views on BT's internal efficiency and costs transformation targets. A PVEO analysis breaks down forecast annual movements in costs into changes due to Price (inflation), Volume effects, Efficiency (or cost transformation) and Other. This analytical approach is therefore conceptually consistent with our approach to estimating efficiency in that a PVEO analysis estimates efficiency after taking

[248] See Annex 7.
[249] Annex 6 describes what these components are and our treatment of them.

account of input price and volume changes. A PVEO analysis covers all of a division's cash costs. It therefore includes operating costs, capital expenditure, costs incurred by the division itself and transfers in from other divisions.

A8.171 As we noted earlier, business connectivity services' costs are made up of costs from several divisions, notably BT Wholesale, TSO and Openreach. For the 2016 LLCC we therefore need not only to analyse several divisions' PVEO analyses but also to combine the results so that they give an indication of likely efficiency gains that better reflect the cost base for business connectivity services.

A8.172 The desire to combine different divisions' results plus the fact that PVEO analyses include both directly incurred costs and transfers from other divisions introduces some analytical issues. The main issues are:

- how to ensure that costs and efficiencies associated with transfer charges from one division to another are not double counted; and
- how to ensure that there are efficiency estimates for all cost lines.

A8.173 We need to be consistent in our consideration of these issues for both the data within the PVEO analyses and also the data that we use to weight the costs together.

A8.174 Below we first discuss these data issues, how we have used the data within BT's PVEO analyses and the efforts we have made to ensure the cost weights we use are consistent. We go on to discuss estimates of divisional efficiency using both historical and forecast PVEOs. We then present the results of combining these divisional results together to reflect better the costs of TI and Ethernet services before setting out our assessment of this analysis.

Data Issues associated with PVEO submissions

A8.175 BT provided us with PVEO analyses for BT Wholesale and Openreach over the period 2011/12 to 2017/18, for TSO from 2013/14 to 2015/16 and for TSO's predecessor organisations BT Operate (BTO) and BT Innovate and Design (BTID) from 2011/12 to 2012/13.[250] The PVEO analyses over the period 2011/12 to 2015/16 have been input to BT's business planning and budgeting processes. The 2016/17 and 2017/18 analyses are inputs to its medium term planning process.

A8.176 BT was unable to provide PVEO analysis for TSO for 2016/17 and 2017/18, because [✂].[251]

A8.177 There was some variation in the structure of these PVEO analyses but in general they showed how costs move from those incurred in one year to the forecast of those in the next year, broken down into Price, Volume, Efficiency (or Cost Transformation) and Other effects.[252] We have calculated the efficiency percentage by dividing the total efficiency or cost transformation savings in the year by the total costs from the previous year.

[250] BT response to 6th s135 notice, Annex 1, response to questions H5 and H7.
[251] BT response to 6th s135 notice, Annex 1, response to question A3.
[252] BT was not able to provide us with historical analyses that showed the movement in actual to actual costs.

A8.178 Some of the PVEOs also showed the impact of "flowthrough" effects[253] from previous years. In some cases the impact of this flowthrough was broken down and efficiency flowthrough savings specifically identified. Where this was not the case we have treated flowthrough as part of efficiency savings.[254]

A8.179 PVEOs contain a mix of external (directly incurred) costs and internal (transfer) charges from other divisions. We observed that the PVEO analyses for many of the cost transfer lines was limited; inflation, volume and efficiency effects were small or zero. We assume this is because these effects would normally be captured within the originating division's PVEO.

A8.180 In general we would like to restrict the PVEO analysis to costs in the originating division and remove the corresponding transfers from the receiving division. This would remove any double counting of costs and would ensure that we use the "better" estimate of efficiency savings. However, given that there is limited breakdown of internal transfers within these PVEOs, matching costs between originating and receiving divisions is difficult.

A8.181 We could have excluded all internal transfer costs when estimating efficiency savings. We have not done this as it may have biased our approach:

- we want to cover potential efficiency for all relevant costs. For example, we are aware that Openreach, TSO and BT Wholesale all receive transfers from Group Property for accommodation charges on Operational Buildings, though these are not separately identified. BT has argued in the past that it is hard to reduce the size of the operational building portfolio so we might expect any cost savings on the costs of these buildings to be relatively low. [255] Property costs account for a reasonable proportion of costs for Ethernet and TI services so excluding all property costs may well result in overstating the potential for efficiency improvements. We have therefore decided to include all accommodation charges;[256] and

- there are some efficiency savings within these internal transfer lines, although these were generally at a lower level than for directly incurred payments.

A8.182 Consideration of the above issues and further analysis of the PVEOs provided has led us to exclude the following costs:

- the transfer charge from the Openreach PVEO analysis for IT costs from TSO as these costs are included within the TSO PVEO;

- the transfer for Cumulo rates from the Openreach PVEO as we could not identify that any savings in these costs had been reflected in the PVEO analysis;

[253] Flowthrough savings are those that result from activities and initiatives undertaken in the previous year that have an effect on the current year.
[254] We do not believe this is a critical assumption in our analysis. Any flowthrough savings for BT Wholesale and Openreach were split between Price, Volume and Efficiency. However, for TSO, this was the case for only one year, 2015/16. This showed that the vast majority of flowthrough savings in that year were due to efficiency.
[255] See for example Section 5.10, page 30 of 2013/14 BT Report requested by Ofcom. This notes "the prohibitive costs and disruption to services of rehousing MDF and cable chambers in order to reduce the size of the operational building portfolio".
[256] We did however note there was no inflation associated with property charges whereas we would have expected these to be around 3% per annum given BT's agreement with Telereal Trillium. To maintain the same forecast outturn this may have resulted in some understatement of efficiency gains.

- POLOs (Payments to other Licenced Operators) from the BT Wholesale PVEO submissions. POLOs are payments for termination of call services and therefore have no relevance to costs for Ethernet and TI services; and

- capex associated with NGA from within the Openreach PVEO submission.

A8.183 We have used the PVEO analyses for operating costs in Openreach, BT Wholesale and TSO, but only that for capex for Openreach. The BT Wholesale PVEO included capex but was small and we have not been able to reconcile this to other information we have. The TSO PVEO analyses did not identify capex separately except in the provisional results for one year in which we had both provisional and final results. We understand that some of TSO's software development costs may be capitalised within the customer facing divisions accounts to which it is transferred, but we would expect TSO to incur other capex, notably on equipment, and we do not appear to have data on this.

A8.184 The efficiency estimates we present below cover both operating costs and capital expenditure. We explain below how we have adjusted the weighting data to reflect the data available to us and in particular the lack of some capex data for TSO and BT Wholesale.

Weighting data

A8.185 As we discuss above BT has provided information that shows which of its divisions contributed costs to the various LLCC markets.[257] We have used this information to weight the different divisional PVEOs together.

A8.186 We have however made the following adjustments to make this weighting cost data consistent with that within the divisional PVEO analyses:

- we have reversed out cost transfers between Openreach and TSO for accommodation, energy costs and IT costs;[258] and

- we have excluded Cumulo rates costs.

A8.187 In calculating our divisional cost weights we have also:

- excluded costs incurred outside Openreach, BT Wholesale and TSO. These are a small proportion of costs for Ethernet and TI services and are mostly costs associated with BT Group Functions.[259] We believe this approach is reasonable given the excluded costs are small and that at least some Group Function transfers are likely to be included in the internal transfers within the Openreach, BT Wholesale and TSO divisional PVEOs; and

- used depreciation as a proxy for the relevant weight to give each division's capex. We do not believe this is a critical assumption but will consider this further prior to our final statement to understand if there are more appropriate ways to provide relevant weights.

[257] BT, Response to 1st s135 notice dated 7 August 2014, responses to questions F3 and follow–up questions A1-3 to Question F3 in the 1st s135 notice dated 10 March 2015.
[258] We used data provided by BT in response to supplementary question following the 1st s135 notice, response to question F3.
[259] BT response to1st s135 notice, Annex 1, response to question F3.

A8.188 Figure A8.33 below shows the resulting shares of costs from applying the above assumptions and adjustments. It is these cost shares that we use to weight divisional analyses together to estimate potential improvements for Ethernet and TI services.

Figure A8.33: TI and Ethernet market costs split by division for 2013/14

Market	Openreach	BT Wholesale	TSO
TI	[✂]	[✂]	[✂]
Ethernet	[✂]	[✂]	[✂]

Source: Ofcom Analysis of data provided by BT in response to the 1st s135 notice

A8.189 We make two observations on these cost weights. First BT Wholesale accounts for a relatively small proportion of costs for TI services and virtually none for Ethernet services. BT Wholesale's results therefore make limited contribution to our overall assessment of efficiency for this charge control. Second we have applied the above weights to all years' figures. We intend to update our analysis using 2014/15 data for the 2016 BCMR Statement. This should allow us to determine the robustness of the above shares and the extent to which we should vary them over time. We discuss this further below.

Estimates of divisional efficiency from BT Management Accounting data

A8.190 Figure A8.34 shows the efficiency estimates we have calculated from BT's PVEO analyses for the period 2011/12 to 2013/14 after making the adjustments that we describe above.

Figure A8.34: Historical estimates of operating cost efficiency for BT divisions from Management Accounting data

BT division	2011/12-2013/14
Openreach	[✂]
BT Wholesale	[✂]
TSO[260]	[✂]

Source: Ofcom analysis of BT PVEO data supplied in response to the 1st s135 notice

A8.191 BT Wholesale's results reflect our decision to include internal transfer costs. If we were to base our estimates for BT Wholesale on its direct costs only then its efficiency estimates would be significantly higher: the range would be [✂]. These would be more in line with the large reductions in BT Wholesale's operating costs reported in BT's 2013/14 statutory accounts.[261] We therefore note that in this analysis we may have understated efficiency savings in BT Wholesale though, as we note above, BT Wholesale's results do not have a major influence on our final estimates.

[260] BT's TSO division was created with effect from 1 January 2013. It merged two BT divisions: BT Operate (BTO) and BT Innovation and Design (BTID). We have we have added the results for BTID and BTO together in 2011/12 and 2012/13 to produce estimates for those that a TSO equivalent organisation might have produced.

[261] See for example BT's press release on its quarter 4 2013/14 and annual 2013/14 results. This is available at https://www.btplc.com/News/ResultsPDF/q414-release.pdf (BT's Q4 Press Release). It includes the following when commenting on BT Wholesale's operating results: "*Operating costs decreased 18% in the quarter. Underlying operating costs excluding transit reduced 11% reflecting lower cost of sales, due to the lower revenue, and the benefit of our cost transformation activities. We reduced selling and general administration costs 22% in the quarter*".

A8.192 We also undertook some checks on the 2013/14 PVEO analysis results to understand the effect of using outturn costs rather than forecast costs.

A8.193 We have compared actual cost data for 2013/14 (contained within the 2014/15 PVEO analyses) to the forecasts for 2013/14 within the PVEOs. 2013/14 actual costs are below the forecasts, though this simple comparison does not explain how much of the difference is due to price, volume, efficiency or other. If we assume that all the differences are due to efficiency, then this would increase the 2013/14 efficiency estimates for TSO [✂] and slightly increase those for BT Wholesale and Openreach. We consider the impact of this potential difference in determining our estimates of historical efficiency for Ethernet and TI services below.

A8.194 Figure A8.35 shows our efficiency estimates from BT's PVEO analyses for the period 2014/15 to 2017/18, again after making the adjustments that we describe above.

Figure A8.35: Forecast estimates of operating cost efficiency for BT divisions from Management Accounting Business Planning data

	2014/15	2015/16	2016/17	2017/18
Openreach	[✂]	[✂]	[✂]	[✂4]
TSO	[✂]	[✂]	Not available	Not available
BT Wholesale	[✂]	[✂]	[✂1]	[✂]

Source: Ofcom analysis of BT PVEO data supplied in response to 1st s135 notice

A8.195 We do not have PVEO analyses for TSO for 2016/17 or 2017/18. We will be requesting a further year's PVEO data for TSO, Openreach and BT Wholesale from BT so the absence of this data will be mitigated to some extent for the 2016 BCMR Statement.

Estimating Ethernet and TI efficiency from BT divisional efficiency estimates

A8.196 Figure A8.36 shows our view of historic efficiency for TI and Ethernet costs based on BT's divisional PVEO submissions.

Figure A8.36: Historical estimates of efficiency gains for TI and Ethernet costs over the period 2011/12 to 2013/14

	Efficiency pa
Reflecting TI cost base	4.5%-8.5%
Reflecting Ethernet cost base	5.0%-7.5%

Source: Ofcom analysis of BT's historical PVEO analyses

A8.197 We have applied the weights underpinning those in Figure A8.33 to the estimates of historical divisional efficiency given in Figure A8.34. As well as considering the data across the period we considered what impact the outturns for 2013/14 might have on the results. We weighted our view of 2013/14 divisional operating and capital expenditure efficiency outturns using the data provided. This was done in two ways; one adjusting the weights to reflect the efficiency data we had (Openreach

opex and capex, TSO and BT Wholesale opex); the other assuming zero capex efficiency for TSO and BT Wholesale.

A8.198 Figure A8.37 shows the result of applying the weights underpinning those in Figure A8.33 to the estimates of forecast divisional efficiency given in Figure A8.35 for 2014/15 and 2015/16. The figures are average efficiency gains per annum. This uses the same approach to weighting as outlined for the historical analysis above.

Figure A8.37: Forecast estimates of efficiency gains for TI and Ethernet costs over 2014/5 and 2015/16

	Efficiency
Reflecting TI cost base	[✂] [5-10% pa]
Reflecting Ethernet cost base	[✂] [5-10% pa]

Source: Ofcom analysis of BT's forecast PVEO analyses

A8.199 We do not have PVEO analyses for TSO for 2016/17 and 2017/18. Figure A8.35 shows there is a step change in the estimates for Openreach and BT Wholesale in 2016/17. We observed a similar effect when moving from budgeting to medium term planning data when analysing efficiency for the June 2014 FAMR Statement. As we noted in that statement such a step change may well be "a consequence of moving to a different forecasting basis".[262] We therefore believe this provides weak evidence of reducing efficiency towards the end of the period.

Observations on our analysis of BT divisional efficiency data

A8.200 There are several factors that may increase or decrease our estimates of historical and future efficiency based on BT's divisional PVEO analyses. We have discussed some of these already and here go on to consider some further issues.

Volume changes

A8.201 Within the 2015 LLCC Model we forecast the effect of **volume** changes using CVEs (cost volume elasticities) for operating costs and AVEs (asset volume elasticities) for capex. [✂] and our CVEs and AVEs are derived from BT's LRIC model. However it is not clear to us how BT divisions estimate the effect of volumes changes, V, within PVEOs. We intend to seek greater clarity on this from BT prior to our final statement. We expect that they do not use AVEs and CVEs but simpler drivers such as, for example, number of people for pay costs.

A8.202 If BT has used simpler drivers, then the implications would be different for Ethernet and TI costs given their different forecast volume profiles. As TI volumes are decreasing this suggests that any positive volume effects within PVEOs would be overstated which would mean that the PVEO analyses overstate potential efficiency for TI costs. But equally as Ethernet volumes are in general increasing quite rapidly that will mean that the PVEO analyses understate potential efficiency for Ethernet costs.

A8.203 We think the potential inconsistency between how volume effects are measured in the PVEO analyses compared to how they are calculated in our 2015 LLCC Model

[262] June 2014 FAMR Statement, Annex 16, paragraph A16.54.

is a limitation of our analysis. Our analyses of BT profitability and of regulatory cost data measure volume effects as in the 2015 LLCC Model.

Inflation

A8.204 Within the 2015 LLCC Model we apply three separate **inflation** figures: one for pay, one for non-pay and one for capital expenditure. In our analysis of BT's divisional PVEOs we have used BT's estimates of price inflation (P). We estimate that the difference between these and our inflation assumption is approximately [✂]. Therefore, if we assume that the P and the E in the PVEO analyses are not independent, then using our inflation assumptions in BT's PVEO analyses would reduce our efficiency estimates by the same amount. However, we consider that this amount is within the margin of accuracy of our efficiency estimates and therefore we do not propose to make the adjustment.

A8.205 We discuss transfer charges above and note that in BT's PVEO analyses, we observe that P (inflation) effects for many internal transfers are low. So for example internal transfers for Openreach, BT Wholesale and TSO should include transfers from BT Property for accommodation charges. We would expect these to have been subject to inflation effects of around 3% on the basis of the agreement between BT and Telereal Trillium.[263] We have however been unable to identify any such P effects. This then casts doubt over what, if any, inflation impacts have been included for internal transfers generally. If price inflation effects are understated for internal transfers then efficiency gains must have been higher to maintain the same final cost forecasts. Our inclusion of all internal transfers may therefore mean we are understating the potential efficiency gains.

Weights

A8.206 We have weighted our analysis of BT's divisional PVEO data using data from 2013/14. Efficiency improvements in TSO have been and are forecast generally to be higher than in Openreach and BT Wholesale. That suggests TSO's costs would form a lower proportion of total costs over time and so its results should have a lower weight towards the end of the period of the charge controls. If we were to reflect this change in weights then this would reduce our estimates of efficiency for both Ethernet and TI services.

A8.207 We also note that the weights we have used do not reflect changes that we have made to the base data for the 2015 LLCC Model. Some of our proposed changes relate to General Overhead costs, which include some costs incurred in TSO. In general our proposals re-attribute costs away from leased line markets. The impact of these changes is therefore likely to decrease TSO's shares of total costs. Again if we were able to reflect this re-attribution of costs within the data we used to construct the weights then we believe this also would reduce our estimates of efficiency for both Ethernet and TI services. We will be updating these weights using 2014/15 data for the statement.

[263] See for example: BT Group, *Financial Review: profit on sale of property fixed assets*, 2002, http://www.btplc.com/report/financial_fixedassets.shtml.

Cumulo

A8.208 We exclude the costs of cumulo rates from our divisional cost weights and from the Openreach PVEO analysis.[264] We do so because we cannot identify within the PVEOs the impact of the large reductions in BT's cumulo rates costs over the past few years, nor any reductions that there may be in the future.

A8.209 Estimating the impact of changes to cumulo rates costs for Ethernet and TI services is difficult to do consistently with our general modelling approach given the recent revisions to attributions of BT's cumulo costs within the March 2015 Directions Statement. We reflect these attribution changes in the 2015 Base Year Model but these are unlikely to have been reflected in historical or future divisional PVEOs given that they are only now being implemented within the RFS.

A8.210 We have also estimated how attributions of cumulo rates costs to Ethernet and TI services might have changed over the past three years under these revised attribution methods. Our analysis suggests that changes in non-NGA related costs are a reasonable indicator for how allocations to Ethernet and TI markets together have changed.

A8.211 We have also reviewed BT's cumulo historical payments and, building on work that we undertook for the June 2014 FAMR Statement, have undertaken our own forecasts for BT's non-NGA Cumulo costs out to 2016/17. Forecasting beyond 2016/17 is difficult given that a new rating list that will come into force in England, Wales and Scotland on 1 April 2017. It is unlikely that BT's revised Cumulo rateable values or ratepoundages will be known in each nation before our 2016 BCMR Statement is published.

A8.212 Our analysis suggests that BT's non-NGA payments:

- [✂][265]; and
- [✂].[266]

A8.213 If we had been able to include the costs of cumulo rates within the PVEO analysis in a way that rigorously reflected the latest attributions we believe this would have increased our estimates of historical efficiency by around [✂]. It is less clear that this is the case for our estimates of future efficiency. As BT's Cumulo payments are now a relatively small proportion of Ethernet and TI costs [✂] of operating costs, the impact would have been relatively small.

Summary of PVEO analysis

A8.214 We believe that BT's historical and forecast PVEOs provide a good source of evidence about potential efficiency gains though there are some issues that we have identified in the course of our analysis.

[264] Openreach is attributed the vast majority of Cumulo rates costs.
[265] Ofcom analysis using data provided by BT in response to questions A1, A3-A5 of the 7th s135 notice,
[266] Ofcom analysis using data provided by BT in response to questions A2-A12 of the 7th s135 notice, follow-up question to A12 asked 6/1/2015, supplementary questions 1-3 asked on 6 Jan 2015, further questions on supplementary questions 2 and 3 asked on 29th January and a further follow-up question on supplementary question 3 asked on 24 February 2015.

A8.215 Our analysis of historical PVEOs suggests that an appropriate efficiency assumption could be approximately [✂]. Our analysis of forward looking PVEOs suggests that the appropriate efficiency assumption could be approximately [✂].

A8.216 There are however several factors that we discuss above that mean these core estimates could be either overstated or understated. The most significant uncertainties are around the way that volume effects are reflected in BT's PVEO analyses and secondly the effect of giving TSO's results a lower weight over time.

A8.217 We believe these uncertainties would have a greater impact on our efficiency estimates for TI services than on Ethernet services. Consequently we believe this evidence provides support for efficiency assumptions within a range of 4-7% per annum for TI costs and 5-7.5% per annum for Ethernet costs.

Analysis of benchmarking study

A8.218 Benchmarking data provides a potentially important source of evidence. It is different to our other evidence in that it assesses BT's performance against other companies, whereas our other evidence assesses historical and forecast BT data only. However there can be issues with interpreting benchmarking data. It is sometimes difficult to make comparisons on a like-for-like basis and to take account of relevant exogenous factors such as population density.

A8.219 In the June 2014 FAMR Statement and June 2014 WBA Statement, we referred to an international benchmarking study, the results of which BT had recently received. For our assessment for this charge control we asked BT to provide updates and further details on that study together with any other benchmarking work it had undertaken.[267]

A8.220 BT provided further data on the results from the study referred to above. This had been undertaken by AT Kearney, who [✂].

A8.221 The benchmarking compared performance [✂].

A8.222 The total efficiency gap, [✂].

A8.223 BT told us that, [✂].

A8.224 If BT incurs costs efficiently on one activity to save costs on another [✂].

A8.225 We believe that giving credit for over performance is more appropriate than not. That is because different companies are run and organised in different ways and there will be different ways of achieving efficiencies and cost savings.

Improving the relevance of the benchmark study for the 2016 LLCC

A8.226 The study considered costs for [✂] business but we have already noted that costs associated with business connectivity services are concentrated within a few BT divisions. The costs covered by AT Kearney's study included [✂]

A8.227 BT provided us with details on how [✂].

A8.228 AT Kearney noted that [✂]

[267] BT response to 1st s135 notice, Annex 1, response to question H1.

A8.229 However the study [✂]

A8.230 We make some further observations on the study and our analysis:

- [✂].
- [✂]
- [✂]
- While AT Kearney have [✂]

A8.231 However this analysis does provide an external insight into BT's relative cost performance. We have concerns about some of the data and, as the study related to data collected in [✂], it could now be viewed as a historical view. Our estimated efficiency gains from this study are lower than those from our analysis of BT's management accounting data but they only reflect catch-up. But it does show that BT was not at the frontier and that there were cost gaps even when compared to a [✂], that there were gaps in activities that related to costs of both Ethernet and TI services. It also provides some evidence that there should be cost gaps that BT could close over the period of the charge control.

Review of other public information

A8.232 We have reviewed two other sources of public information on BT's cost performance: analyst reports and BT's press releases following the announcement of its most recent BT plc. results for 2014/15.

Analyst reports

A8.233 BT held a Cost Transformation Teach-in[268] in December 2014. BT's conclusions were that:

- *"Cost transformation continues at pace;*
- *Plenty more opportunities identified;*
- *A key part of our strategy, supporting customer service and investing for growth".*[269]

A8.234 Following this event a number of analysts provided their thoughts on the efficiencies that BT might achieve in the future. These analysts included:

- [✂]
- [✂]
- Deutsche Bank, who expressed the view that "*BT…believes that although the 'low-hanging fruit has been picked' there is still upside on costs*" and then explained that between 2011 and 2014 "*The impressive cost transformation team at BT has evolved from 30 to 130 consultants*" which had obtained "*c£5bn net [cost savings] achieved over the five years to Mar14, a period which saw*

[268] BT, *Cost Transformation Teach-in*, 9 December 2014, https://www.btplc.com/Sharesandperformance/Presentations/downloads/CTteach-in_9Dec2014.pdf
[269] See slide 37, BT, *Cost Transformation Teach-in*, 9 December 2014, https://www.btplc.com/Sharesandperformance/Presentations/downloads/CTteach-in_9Dec2014.pdf

revenues fall by £3bn" but that "*BT claims there are still more than £1bn of gross cost savings opportunities*".[270]

A8.235 Analysts therefore appeared to accept BT's proposition that it had the potential to continue to cut costs quite significantly. There is however some suggestion that these reductions may be more difficult to achieve in the future. The above therefore provides qualitative support for the view that BT has opportunities to continue to cut costs over the charge control period.

BT's financial performance in 2014/15

A8.236 On 7 May 2015, BT released its results for 2014/15.[271] The headline was that EBITDA was up 3%, despite a fall in underlying revenue of 0.4%, due to BT taking costs out of the business.[272] Net labour costs reduced across the Group by 8% year-on-year as BT "*increased productivity while reallocating [its] labour resource to be more efficient*".[273] Underlying operating costs, excluding transit, were down 2%, with property and energy costs up 1% and other costs down 1%.[274] BT noted that "*we continue to focus on transforming our cost base*".[275] All costs savings quoted are in nominal terms so cost reductions in real terms will have been higher.

A8.237 BT Wholesale reduced its operating costs by 12% with a 14% reduction in capital expenditure.[276] These reductions are significantly higher than we observe within our analysis of BT Wholesale's 2014/15 PVEO analysis, though closer to the expected decrease in external costs. Openreach reduced its operating costs by 2% from 2013/14 with a 3% increase in capital expenditure.[277] Results for TSO are not separately reported as TSO is not a customer facing line of business. Some of the cost reductions reported for Openreach and BT Wholesale will therefore be the result of cost reductions in TSO. We have already noted the importance of TSO and Openreach to costs in business connectivity markets.

A8.238 It therefore appears that BT reduced costs significantly in 2014/15. That is consistent with the cost forecasts within the 2014/15 PVEO analyses that BT submitted (see our analysis of internal management accounting data discussed above).

A8.239 Although the above is not specific to business connectivity markets and does not reflect any changes in volumes, it provides further evidence that BT continues to cut costs and improve its efficiency. Furthermore, it shows that there were reductions in divisions such as Openreach and BT Wholesale that contribute costs to both TI and Ethernet services.

Summary of evidence on efficiency

A8.240 In this section we have discussed our analysis of the efficiency gains that we expect BT to be able to deliver up to the end of the proposed charge control period. We explain the key assumptions we have made, have highlighted any limitations in the

[270] Deutsche Bank - *BT Group PLC Alert - Reinforcing credibility on costs ahead of deals, content and convergence,* paragraphs 1, 2 and 3, 10th December 2014,
[271] See BT's Q4 press release.
[272] BT's Q4 press release, page 1. Underlying revenue is "underlying revenue excluding transit"
[273] BT's Q4 press release, page 5.
[274] BT's Q4 press release, page 5. Underlying operating costs is "underlying operating costs excluding transit"
[275] BT's Q4 press release, page 9.
[276] BT's Q4 press release, page 13.
[277] BT's Q4 press release, page 14.

analysis we have undertaken and have identified where we intend to follow-up data issues.

A8.241 We have used the same evidence to assess potential efficiency improvements for both Ethernet and TI services though we have assessed the impact for each set of services separately. A summary of our evidence is presented in Figure A8.38 below.

Figure A8.38: Evidence on Ethernet and TI efficiency assumption

Evidence	Period	TI efficiency	Ethernet efficiency
Ofcom analysis of BT's management accounts (PVEOs)	Historical - (2011/12 to 2013/14)	4.5% – 8.5% pa	5.0% – 7.5% pa
Ofcom analysis of regulatory cost component data	Historical - (2009/10 to 2013/14)	2.0-3.0% pa	8.0-10.5% pa
Ofcom analysis of benchmarking report - 2013 AT Kearney Report	Historical - (2012/13 to 2014/15)	[✂]	[✂]
Ofcom analysis of BT's 2013/14 financial performance	Current - Rerun of 2013 LLCC model with other assumptions consistent with 2015 LLCC Model	5% pa	5% pa
Consideration of BT's Annual report for 2014/15	Current – 2014/15	Significant cost reductions and efficiency improvements in 2014/15.	
Ofcom analysis of BT's management accounts (PVEOs)	Forecast - (2014/15 to 2017/18)	[✂] [5-10% pa]	[✂] [5-10% pa]
Consideration of statements made by BT and Broker reports	Forecast	Cost transformation remains a key part of BT strategy Analysts believe efficiencies are still available but likely to become more difficult to achieve over time.	

A8.242 The available evidence produces a wide range of estimates but these are in general are above those we adopted for the March 2013 BCMR Statement.

A8.243 Given our analysis set out in the section above we believe that our analysis of BT's historic and forecast internal management accounting data is likely to be the most relevant evidence for proposing efficiency assumptions for Ethernet and TI Services for the duration of the 2016 LLCC. These suggest efficiency estimates for both TI and Ethernet services of between 4.5% and 8.5% pa. We however do not propose to adopt a proposal towards the top end of the range given:

- the need to further investigate the way volumes have been taken account within the historic and forecast internal management accounting;[278]

- the higher estimates tend to be driven by efficiency improvements in TSO so TSO should perhaps have a lower weight towards the end of the charge control period; and

- it may be more difficult to achieve efficiency improvements in the future, as suggested by analysts commenting on BT and the weak evidence of forecast PVEOs from BT's medium term planning process.

A8.244 We intend to undertake further work on these issues prior to the publication of our 2016 BCMR Statement.

A8.245 Some of our evidence, in particular our analysis of component cost data and the historical benchmarking data, support a proposed efficiency assumption below 5%. However, we place limited reliance on the regulatory cost analysis, which suggests efficiency assumptions lower than 5% for TI services (but conversely higher values for Ethernet services) due to the variability in estimated values produced. The benchmarking data suggested efficiency assumptions [✂] per annum for TI and Ethernet services respectively –however it only estimates catch-up efficiency. We have used this to inform our lower bound of 4% per annum.

A8.246 We therefore propose to adopt an efficiency range of 4-7% per annum with a base of case 5% for both Ethernet and TI services. This base case is broadly consistent with our assumptions in June 2014 FAMR Statement and the March 2013 BCMR Statement, and is supported by our analysis of BT's 2013/14 financial performance.

Input price inflation

Introduction

A8.247 As set out in Sections 6 and 7, in calculating the charge control, we take into account an assumed inflation rate that we expect BT to face between our base year and the last year of the charge control.

A8.248 In paragraph 3.15 *et seq* we explain our choice of CPI as the measure of inflation for indexing the charge control. Separate from how we index the charge control, it is also necessary to define how input prices for cost items vary over the modelling period in the 2015 LLCC Model. Our modelling approach to costs considers input price inflation separately from efficiency and the effects of changes in volumes. Furthermore, consistent with the 2015 LLCC Model, we forecast input price inflation for pay, non-pay operating costs and assets separately. This approach enables us more accurately to forecast costs by taking into account different inflation rates for different costs types. As with our general modelling approach, we seek to base our forecasts of input price changes on those that we consider would be faced by BT.

A8.249 We have analysed evidence from a range of sources, some generated by BT and others based on independent data. We use a mixture of historical evidence and forecasts.

[278] This is likely to result in decreases in efficiency for TI costs but may increase in efficiency for Ethernet costs.

A8.250 Our inflation assumptions are combined with our efficiency assumptions our volume forecasts and our AVE and CVE assumptions (set out above in this Annex) to provide forecasts for operating and capital expenditure.

Pay

A8.251 We have considered historical and forecast data in order to forecast BT's future pay inflation. In particular we have considered:

- BT's management information (PVEO);
- data from BT's Annual Reports and BT's management accounts;
- reports of the pay agreement with the Trade Unions; and
- some economy-wide pay indices.

A8.252 Below we set out our analysis of these data sources and explain that we have based our assumptions on BT's management information (PVEO) and the economy-wide pay indices, given limitations with the other sources of evidence.

BT's management information (PVEO)

A8.253 Above in the Efficiency section we set out our analysis of BT's PVEO forecasts. We have used these PVEO analyses to assess input cost inflation and our appropriate efficiency targets. A benefit of this approach is that it allows us to be consistent across these two assumptions. A further benefit of the PVEO based evidence is it provides estimates of both expected historical inflation and forecast inflation and that these estimates are BT-specific which reflect management's knowledge of the labour markets in which BT operates.

A8.254 BT's PVEO analyses show how a division's costs change from actual costs in one year to forecast costs in the next, in terms of price changes, volume effects, efficiency and other. In general these costs are split between external costs, i.e. those directly incurred by the BT division, and internal costs, i.e. transfer charges of costs incurred by other BT divisions. Pay costs are generally analysed separately to non-pay costs. The pay costs are total pay costs and so include pension costs, social security costs and wages and salaries. The different pay cost elements are not analysed separately. For our analysis we can use the 'price' effects derived from the PVEO analysis as estimates of input price inflation. We have extracted inflation in pay costs as forecast by Openreach, BT Wholesale and TSO and its predecessor organisations over a number of years. Our pay inflation estimates derived from BT's PVEO analysis are set out in Figure A8.39 below.

Figure A8.39: Pay cost inflation – derived from PVEO analysis

Pay inflation	Historical					Projected			
	09/10	10/11	11/12	12/13	13/14	14/15	15/16	16/17	17/18
Openreach	✂	✂	✂	✂	✂	✂	✂	✂	✂
TSO	✂	✂	✂	✂	✂	✂	✂	✂	✂
BT Wholesale	✂	✂	✂	✂	✂	✂	✂	✂	✂
Weighted average range	0.5% to 3.0%					2% to 3%			

A8.255 The PVEO analysis suggests that historically, pay inflation was expected to be in the region of 0.5% to 3.0%, with an average[279] of [✂]. Looking forward, the PVEO analysis suggests pay inflation is forecast to be in the region of 2% to 3% with an average[279] of [✂].

Data from BT's Annual Reports and management accounts

A8.256 We have considered BT's pay costs as reported in BT's Annual Reports[280] and from its management accounting information[281], but rejected because we could not distinguish between pay inflation and efficiency.

Pay agreement with the Trade Unions

A8.257 In 2014 BT reached a 33-month pay agreement (up to 30 May 2017) with the Trade Unions which represent its staff. The pay deal[282] was for a 2% increase in base pay in 2014 plus a flat rate increase of £200, which equates to rises of between 2.5% and 3%. The pay agreement for 2015 and 2016 is for an increase of 2.5% with further discussion if RPI inflation is outside the range of 2 to 3% (measured at February 2015 and 2016).

A8.258 Although the evidence is forward looking and BT specific, we place less weight on it than PVEO analysis for the following reasons:

- because to do so may create perverse incentives for BT's negotiations with the unions in future; and
- total pay costs include pensions and social security costs as well as wages and salaries; the pay agreement is only directly relevant to the latter and indirectly relevant to social security costs (which tend to increase with base pay).

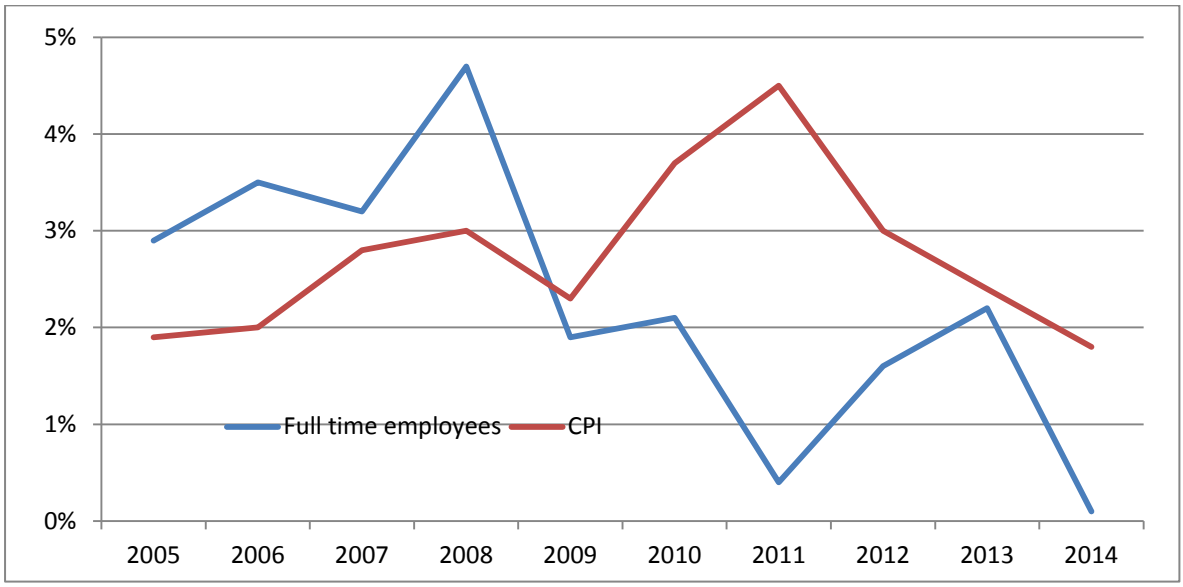
[279] A simple, unweighted average of the data points.
[280] For example BT, 2015 Annual Report, https://www.btplc.com/Sharesandperformance/Annualreportandreview/pdf/2015_BT_Annual_Report.pdf
[281] Response to the 1st s135 notice dated 7 August 2014.
[282] BT, Pay Review 2015, http://www.prospect.org.uk/select_an_industry/telecoms/employers/bt/payreview/index?_ts=1

Economy wide pay indices

A8.259 The above analysis is based on BT pay data. To assess our pay inflation assumption, we have also analysed some economy-wide pay indices.

A8.260 The ONS collects a range of data related to the UK labour market through the Annual Survey of Hours and Earnings and estimates including, amongst other things, the annual percentage change in median full-time gross weekly earnings for all employees.[283] This annual change can be considered as an estimate of the average historical pay inflation for the UK. We set this data out in Figure A8.40 below.

Figure A8.40: Annual percentage change in median full-time gross weekly earnings for all employees



Source: Figure 2, Annual Survey of Hours and Earnings, 2014 Provisional Results, Office of National Statistics. http://www.ons.gov.uk/ons/dcp171778_385428.pdf

A8.261 This measure of historical pay inflation suggests that from 2009 onwards pay inflation has been between zero and approximately 2% (on average 1.4%); and below CPI inflation. In contrast the period before 2009 was characterised by pay inflation above approximately 3% and above CPI inflation.

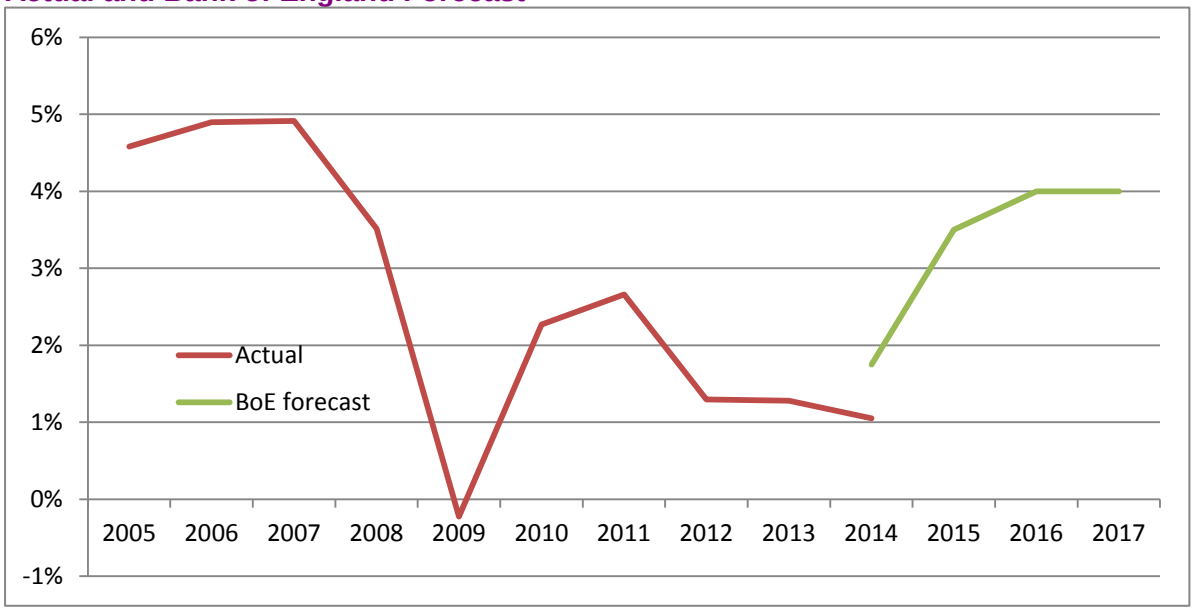
A8.262 We interpret this evidence to mean that while pay inflation has recently been relatively low, that has not always been the case and therefore it is important to not just look at the recent past but also to look forward.

A8.263 For this purpose we have examined another economy-wide pay index (annual growth in the average weekly earnings (total pay, i.e. including bonuses)) from the ONS. The advantage of this data series is that this metric is also forecasted by the Bank of England.[284] We set out both of these in Figure A8.41 below.

[283] ONS, *Annual Survey of Hours and Earnings, 2014 Provisional Results*, *Office of National Statistics*, 19 November 2014, http://www.ons.gov.uk/ons/dcp171778_385428.pdf

[284] Bank of England, *Conditioning assumptions, MPC key judgments, and indicative projections*, February 2015 http://www.bankofengland.co.uk/publications/Documents/inflationreport/2015/febca.pdf (Bank of England Inflation Report).

Figure A8.41: Annual percentage change in average weekly earnings (total pay). Actual and Bank of England Forecast



Source: Ofcom calculations based on Office of National Statistics data series KAB9, http://www.ons.gov.uk/ons/datasets-and-tables/data-selector.html?cdid=KAB9&dataset=lms&table-id=15 *Table 4, Bank of England Inflation Report, February 2015*

A8.264 Looking at the historical data, this measure of pay inflation (the percentage changes in the average weekly earnings (total pay)) shows a slightly greater level of variability than the first measure we examined (the annual percentage change in median full-time gross weekly earnings for all employees), but the average rate of the two series since 2009 is the same (1.4%).

A8.265 However, the Bank of England forecast (used in its February 2015 Inflation Report) suggests that the percentage change in average weekly earnings (total pay) will increase from current levels up to 4.0% per annum. This equates to an average rate of 3.1% per annum from our base year up to the end of the forecasts (2017).

A8.266 Regardless of which index is used, we note that in previous reviews, for example the June 2014 WBA Statement,[285] we considered that while average weekly earnings may be a good indicator of wages and salaries and social security inflation, it may not be a good indicator of pension cost inflation. This is significant as pension costs comprise approximately 10% of BT's total payroll costs and because BT's pension costs appear to have recently shown significant year-on-year variation.[286] For this consultation we therefore propose to place less weight on the above analysis than the PVEO analysis.

Our estimate of pay inflation

A8.267 Figure A8.42 below summaries our historical and forward looking PVEO analysis for Openreach (OR), BT Wholesale (BTW) and TSO (and an overall range) and the historical and forward looking average weekly earnings (AWE) inflation estimates.

[285] See paragraph A7.99, June 2014 WBA Statement.
[286] In June 2014 WBA Statement we noted that pension costs per FTE appeared to be reducing in nominal terms in 2012/13. In contrast to the reduction in 2012/13, the Annual Report for 2013/14 shows an increase in pension costs per FTE of 18% and the Annual report for 2014/15 shows no increase in pension costs per FTE.

Figure A8.42: Summary of our PVEO analysis and AWE inflation estimates

[✂]

A8.268 We have a preference for the PVEO based estimates because they are BT-specific and they capture all pay costs. The average pay inflation from the historical PVEO analysis suggests an appropriate inflation rate of around [✂] [2% to 3%] Forward looking PVEO based estimate of payroll inflation is on average [✂] [2% to 3%] is slightly higher than the historical PVEO estimates.

A8.269 We have slight concerns with the AWE data's ability to capture pension cost inflation and because it is not BT-specific. However, the data suggests that the future may be different to recent history. For this reason we consider we should place more weight on the forward looking PVEO estimates.

A8.270 On this basis we consider that the appropriate forecast payroll inflation to be used in our modelling is in the range of 2% to 3%. We consider that an estimate of 2.5% (the mid-point of this range) is appropriate and consistent with the forward-looking PVEO average and the pay agreement with the Trade Unions.

Non-pay costs

A8.271 As well as forecasting pay inflation, we also need to estimate the appropriate inflation rate for non-pay operating costs. Non-pay operating costs include some costs types which may face very specific and different inflation rates. Therefore, in order to more accurately forecast non-pay inflation, we separately estimate inflation for energy, accommodation and cumulo costs. We then combine these estimates with all 'other' non-pay cost inflation to estimate the appropriate overall rate for non-pay cost inflation.

Energy

DECC forecasts

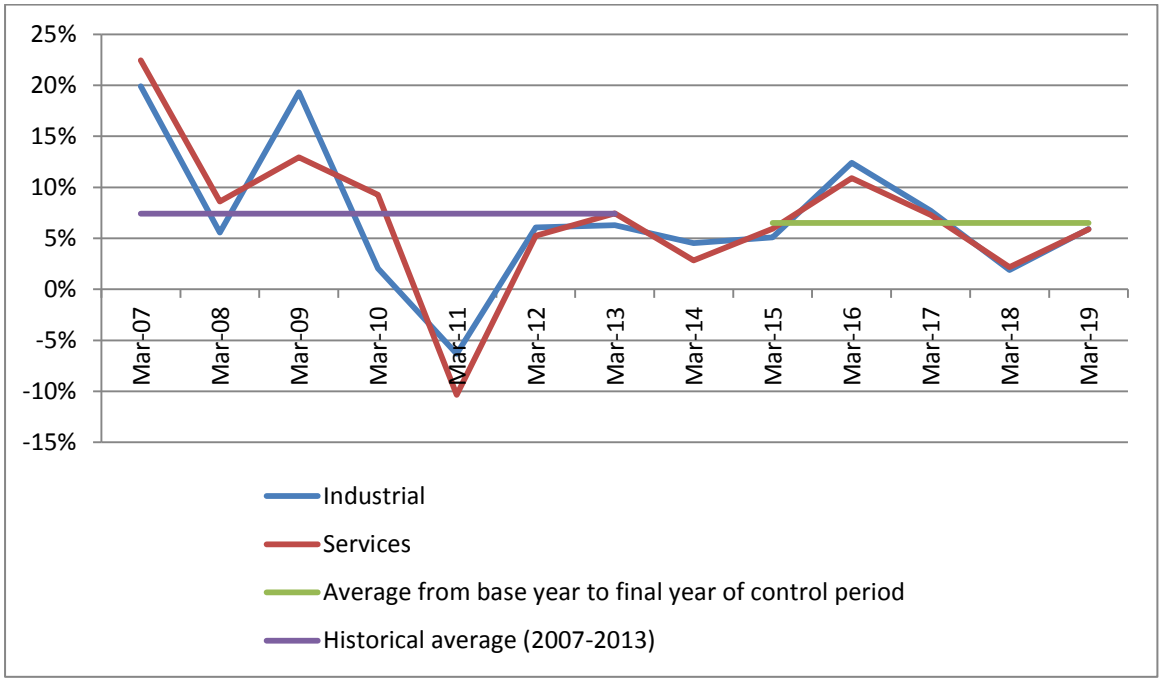
A8.272 Each year the Department of Energy and Climate Change (DECC) publishes updated energy projections (UEPs),[287] analysing and projecting future energy use and greenhouse gas emissions in the UK. The projections are based on assumptions of future economic growth, fossil fuel prices, electricity generation costs, UK population and other key variables.

A8.273 We have used DECC's forecast of electricity retail prices per kilowatt hour for 'industrial' and 'services' from the 2014 UEP to estimate electricity price inflation for BT. We have used DECC's reference scenario forecast which is based on its central estimates of growth and fossil fuel prices.

A8.274 DECC forecasts are based on calendar years and prices are deflated using the ONS' GDP deflator. We have re-inflated the prices using ONS' GDP deflator and converted to a March year end. Our analysis is set out in Figure A8.43 below.

[287] Annex M, DECC Updated Energy & Emissions Projections - September 2014, https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/399175/Annex_M__corrected_23-Dec-2014_.xls

Figure A8.43: Annual percentage change in retail electricity price for industrial and services p/kWh



Source: Ofcom calculations based on DECC UEPs and ONS GDP deflator

A8.275 There are significant year-on-year changes in both actual and forecast electricity price inflation. However, Industrial electricity price inflation and Service electricity price inflation track closely and the forecast compound average growth rate between the base year and the last year of the control period for both are very close at 6.5% (and slightly lower than recent history at c7.5%). Therefore we have not had to reach a view as to whether Industrial or Services is the best comparator for BT's likely electricity costs.

A8.276 The DECC forecast suggest that electricity price inflation can vary significantly from year to year. We will update this analysis before our 2016 BCMR Statement.

PVEO analysis

A8.277 [✂] is the only division which separately identifies energy price inflation. Its PVEO analysis suggests that energy price increases are estimated to be [✂]

Our estimate of energy price inflation

A8.278 In effect, both the PVEO and the DECC forecasts provide an estimate which is within the margin of accuracy of estimation. DECC provides longer run independent forecasts and, because energy price inflation shows a higher degree of volatility than pay inflation, it is important to use a forecast which covers as much of the period as possible. We propose to adopt the DECC forecasts for our modelling purposes.

Accommodation and Cumulo

A8.279 Consistent with other recent reviews, we propose that accommodation rental charges should be forecast to increase at 3% per annum, which is consistent with

BT's agreement with Telereal Trillium.[288] Facilities costs are not subject to the same agreement. We have therefore assumed that Facilities costs (included within 'other') will increase in line with CPI consistent with our approach in recent charge controls.

A8.280 Our inflation assumption for Cumulo captures the increase in the multiplier (also called the rate poundage in Scotland). We assume that the Valuation Office's current approach to the multiplier (which increases in April each year based on the previous September's RPI inflation rate) will continue. We therefore forecast Cumulo to increase by RPI inflation. To estimate RPI inflation elsewhere in the charge control we use the average of HM Treasury's independent forecasts and do so again here albeit with an adjustment to reflect the September reference date of Cumulo. On this basis the average between the base year and the last year of the control period is estimated to be 2.3% per annum.

All other non-pay costs

A8.281 Costs other than those specifically mentioned above comprise approximately a half of non-pay operating costs (and approximately a quarter of all operating costs). Consistent with previous charge controls, where a specific rate cannot be reliably identified, we consider that a measure of general inflation such as CPI would be an appropriate measure to use to forecast non-pay costs. The average CPI inflation between the base year and the last year of the control period is 1.5% per annum. This is based on the average of the independent forecasts and consistent with our approach to CPI inflation used elsewhere in the charge control.

A8.282 Although in other recent charge controls we use CPI inflation where a specific rate cannot be reliably identified, we have also examined BT's PVEO analysis of non-pay and non-energy costs in Figure A8.44 below.

[288] See for example: BT Group, *Financial Review: profit on sale of property fixed assets*, 2002, http://www.btplc.com/report/financial_fixedassets.shtml.

Figure A8.44: Projected non-pay, non-energy costs (internal/external costs) derived from PVEO analysis

	Historical			Projected			
	11/12	12/13	13/14	14/15	15/16	16/17	17/18
Internal costs							
Openreach	✂	✂	✂	✂	✂	✂	✂
TSO	✂	✂	✂	✂	✂	✂	✂
BT Wholesale	✂	✂	✂	✂	✂	✂	✂
External costs							
Openreach	✂	✂	✂	✂	✂	✂	✂
TSO	✂	✂	✂	✂	✂	✂	✂
BT Wholesale	✂	✂	✂	✂	✂	✂	✂
Weighted average range	0% to 2.5%			0% to 1%			

A8.283 However, the comparison is not straight forward because the PVEO analyses provide estimates of non-pay, non-energy inflation and therefore include accommodation and Cumulo where appropriate in the range [✂].

A8.284 We propose to estimate Cumulo and accommodation cost inflation separately. However, below we check our overall inflation assumption against the overall PVEO inflation assumption to ensure consistency with the PVEO analysis used in deriving our efficiency assumptions.

Provisional conclusion non-pay inflation assumption

A8.285 We combine our individual assumptions to calculate an overall non-pay inflation assumption based on a weighting derived from the management accounting information. This is set out in Figure A8.45 below.

Figure A8.45: Summary of non-pay inflation assumption

Nature of cost	Assumption basis	Assumption Value	[Indicative] Weighting
Energy	DECC	6.5%	[✂] [0-20%]
Accommodation	Contractual rate	3.0%	[✂] [20-40%]
Cumulo	RPI	2.3%	[✂] [0-20%]
All other non-pay costs	CPI	1.5%	[✂] [40-60%]
Weighted average		2.6%	100%

A8.286 Based on the above analysis we propose that the appropriate forecast for non-pay inflation to be used in our cost modelling is 2.6%.

Asset price inflation

A8.287 Duct and copper are valued through the RAV-based approach (RPI inflation) which is discussed in Annex 7.

A8.288 We have examined details of asset value changes provided by BT. These showed that for all assets (other than duct and copper) there was virtually no increase in value for the five years ended 31 March 2014; the compound average growth rate was [✂]

A8.289 We also derived capex inflation estimates from the PVEO analysis for Openreach and BT Wholesale, which includes duct and copper. The estimated capex inflation was [✂] on average for the seven years up to 2017/18. In effect, this would align with a weighted average rate of duct and copper of RPI inflation and an estimate of [✂] inflation for all other assets.

A8.290 Holding gains (or losses) occur when the value of an asset held by BT increases (or decreases) in value. If there were significant holding gains it would suggest that BT's asset prices were increasing and therefore an assumption of zero might not be appropriate. We examined the magnitude of holding gains and losses reported in the RFS for the business connectivity markets for each of the four years ended 31 March 2014. On an annual basis holding gains and losses as a percentage of MCE varied from 1.3% loss to a 2.2% gain, with an average 1.0% gain. Furthermore, there was no material difference between Ethernet and TI services averages.

A8.291 Given MCE represents the net cost[289] (after the deduction of accumulated depreciation), holding gains as a percentage of MCE are likely to be an overstatement of asset price inflation. We therefore consider that holding gains reported in the RFS for each of the four years ended 31 March 2014 support the assumption of zero inflation for assets other than Duct and Copper.

[289] Net replacement cost is approximately 30% of gross replacement cost.

A8.292 Consistent with recent reviews we use zero asset price inflation (i.e. flat nominal prices) for all assets other than Duct and Copper.

Consistency of the efficiency and inflation assumptions

A8.293 While theoretically inflation and efficiency are separate concepts; we look to ensure that our approach to both is consistent because practically it may not always be possible for BT (or us) to differentiate between the two.

A8.294 Inflation has been separately estimated for pay, non-pay and asset price inflation. In the efficiency section, we estimate a single efficiency value for these items.

A8.295 The PVEO analysis has been used as an important source of evidence on efficiency. If we were solely to use PVEO analysis for inflation, then there would be no issues as to whether changes in costs were an efficiency effect or a price effect or any mixture of the two. We have used inflation assumptions consistent with the PVEO analysis for pay and energy cost inflation. For all other operating costs (including accommodation and Cumulo) the PVEO analysis suggests an inflation rate of [✂]. However, based on the above analysis we have estimated inflation for accommodation of 3%, Cumulo of 2.3%, other operating costs of 1.5% and capital expenditure of 0%.

A8.296 In order to compare our inflation estimate with that from the PVEO analysis we estimate our overall inflation assumption (i.e. operating and asset price inflation) and compare it to the PVEO equivalent. We estimate that the difference is [✂] than that assumed in the PVEO analysis). Consequently, in order to be consistent, we need theoretically to consider decreasing our efficiency estimate by [✂]. However, this adjustment is within the margin of accuracy of our estimates of efficiency and inflation and while PVEOs are used as an important source of evidence for our efficiency assumption we also take into account other evidence (as set out above).

Annex 9

Cost of capital

Introduction

A9.1 In this annex we set out our proposed estimate of the weighted average cost of capital (WACC) to be used in the LLCC.

A9.2 In charge controls on BT since 2005 we have estimated and applied a different WACC for different parts of BT because we considered that the different parts of BT had different systematic risk profiles. We estimated the WACC for BT Group plc (BT Group) and split this into a WACC for Openreach copper access and a WACC for the rest of BT (RoBT). The RoBT WACC has previously been used in leased lines charge controls, including the 2013 LLCC.

A9.3 However, as explained in this annex, we do not consider that it is appropriate to apply the RoBT WACC to the leased lines business for the purposes of this consultation and we are consulting on an alternative approach. This alternative approach would see the RoBT WACC separated into a WACC appropriate to use for the LLCC (and, if adopted, for Other UK telecoms services) which we have referred to as the 'Other UK telecoms' WACC and a new RoBT WACC which would primarily include BT's Global Services division.[290]

A9.4 For this consultation we propose to use a pre-tax nominal WACC for UK telecoms services – which would include leased lines – of 10.1%.

A9.5 A number of the parameters used in this WACC calculation are the same as those used in the WACC calculation published in the March 2015 MCT Statement. This is because these parameters relate to economy-wide factors rather than company-specific factors. The main differences between the WACC calculations presented here and in the March 2015 MCT Statement relate to: i) the asset beta; ii) the debt premium; and iii) the forward looking gearing rate used to calculate an equity beta and used as a weighting in the WACC calculation. In recognition that some of these parameters could change between now and the 2016 BCMR Statement, in our sensitivity analysis we have used a range for the pre-tax nominal WACC of 9.1% to 11.1%% (see Annex 6 of this consultation).

A9.6 Our consultation estimates of the WACC for BT Group, Openreach copper access, Other UK telecoms and RoBT are shown in Table A9.1.

[290] The Other UK telecoms WACC includes the non-copper access part of Openreach as well as BT's Wholesale, Consumer and Business divisions. We note that these divisions will provide a range of value added activities, such as content. However, we do not seek to isolate the effects of providing these services because benchmark telecoms operators also purchase and provide a similar set of services. We note that BT's Global Services division can be benchmarked against other ICT companies and we have taken this into account when disaggregating the BT Group asset beta as explained later in this annex.

Table A9.1: BT WACC estimates, June 2015

WACC component	BT Group	Openreach copper	Other UK telecoms (including leased lines)	RoBT
Real risk-free rate (RPI)	1.0%	1.0%	1.0%	1.0%
RPI inflation	3.2%	3.2%	3.2%	3.2%
Nominal risk-free rate	4.2%	4.2%	4.2%	4.2%
Equity Risk Premium	5.3%	5.3%	5.3%	5.3%
Debt beta	0.10	0.10	0.10	0.10
Asset beta	0.74	0.50	0.75	1.10
Asset beta weight	*100%*	*25%*	*60%*	*15%*
Gearing (forward looking)	30%	30%	30%	30%
Equity Beta	1.01	0.67	1.03	1.53
Cost of equity (post-tax)	9.6%	7.8%	9.7%	12.3%
Cost of equity (pre-tax)	12.0%	9.7%	12.1%	15.4%
Debt premium	1.2%	1.0%	1.2%	1.4%
Corporate tax rate	20%	20%	20%	20%
Cost of debt (pre-tax)	5.4%	5.2%	5.4%	5.6%
WACC (pre-tax nominal)	10.0%	8.4%	10.1%	12.5%

Source: Ofcom

How we calculate the cost of capital

A9.7 Companies have two basic ways of obtaining funding, through debt or equity. By knowing the proportion of each type of funding, and estimating the cost of each, we can estimate the WACC.

A9.8 The pre-tax nominal WACC is defined as follows:

$$WACC = \frac{Ke * (1 - g)}{1 - t} + Kd * g$$

where:

Ke = the cost of equity which is given by reference to the risk-free rate (RFR), the expected return on the equity market as a whole over the risk-free rate (i.e. the equity risk premium, or ERP) and the perceived riskiness of the asset in question (βe). The model that we have consistently used for estimating the cost of equity is the Capital Asset Pricing Model (CAPM), which the Competition Commission (CC) has previously found to be the most robust way for a regulator to measure the returns required by shareholders[291]. We consider that it remains the most appropriate method for estimating the cost of capital for regulatory purposes and we place weight on taking a consistent approach to estimating the cost of equity within the WACC over time. The cost of equity under the CAPM model can be written as:

$$Ke = RFR + ERP * \beta e$$

Kd = the cost of debt, which is given by reference to the risk-free rate and the debt premium of the firm, dp, such that:

$$Kd = RFR + dp$$

t is the corporate tax rate; and

g = gearing (debt funding as a proportion of total debt and equity funding).

Key parameters

A9.9 There are a number of parameters that we have to estimate in order to calculate a WACC for BT Group.

A9.10 Some of these parameters reflect economy-wide factors that affect all firms. We recently considered these economy-wide factors as part of the March 2015 MCT Statement. For the purposes of this consultation we have adopted the same values for these economy-wide parameters as in the March 2015 MCT Statement given that this was published very recently. Specifically, we assume:

- **Real risk-free rate (RFR) of 1.0%**: In the March 2015 MCT Statement we decided to reduce the real RFR from 1.3% to 1.0%.[292] We said that in setting the real RFR we try to strike a balance between longer term average yields on index-linked gilts and current yields on those gilts. We placed more weight on longer term average yields than on spot rates. We reduced our estimate of the real RFR in line with the reduction in long term average yields. Combined with our RPI

[291] Paragraph 13.19, Competition Commission, *Northern Ireland Electricity Limited price determination*, *A reference under Article 15 of the Electricity (Northern Ireland) Order 1992,* 26 March 2014, https://assets.digital.cabinet-office.gov.uk/media/535a5768ed915d0fdb000003/NIE_Final_determination.pdf (2014 NIE Final Determination).
[292] Paragraphs A10.11 to A10.30, March 2015 MCT Statement.

inflation forecast for this consultation of 3.2% (see next sub-section), the nominal RFR is 4.2% (using the Fisher equation[293]).

- **Equity risk premium (ERP) of 5.3%**: In the March 2015 MCT Statement we decided to change the ERP from 5% to 5.3% in order to maintain the total market return (TMR) at 6.3% (the TMR is the sum of the real RFR and the ERP).[294] We said that, having decided to reduce the real RFR the question was whether the ERP should increase to maintain an unchanged TMR or whether the ERP should remain unchanged and the TMR should be reduced. We recognised that there may be an inverse relationship between the real RFR and ERP. We said we preferred to maintain a relatively stable TMR. We therefore placed weight on the TMR approach and cross checked the resulting ERP (derived from deducting the real RFR from the TMR) against other evidence on the ERP, such as historical premiums of equities over gilts. We considered that a TMR of between 5.5% and 6.5% was supported by the evidence and our TMR of 6.3% sat in this range. A TMR of 6.3% implied an ERP of 5.3% after deducting our real RFR estimate of 1.0%. We considered that an ERP of 5.3% was supported by the evidence on historical premiums over UK equities, academic surveys and regulatory precedent.[295] We said that the move from an ERP of 5% to an ERP of 5.3% reflected a rebalancing of the real RFR and ERP as components of the TMR.

- **Corporate tax rate of 20%**: In the Budget of April 2013, the UK Government announced its intention to reduce the corporate tax rate from 23% to 21% for 2014/15 and to 20% for 2015/16.[296] We propose to use a corporate tax rate of 20% since this represents the best estimate of what the tax rate will be on a forward-looking basis. This is consistent with the 20% tax rate used in the March 2015 MCT Statement.[297]

A9.11 For the 2016 BCMR Statement we will review whether these economy-wide parameters remain appropriate in the light of more recent market data.

A9.12 The following sections of this annex consider the remaining parameters for the BT Group WACC calculation, specifically: i) RPI inflation, ii) equity beta, iii) debt beta, iv) gearing and v) the debt premium. We then consider the asset beta and debt premium appropriate to use in our WACC calculations for Openreach copper access, Other UK telecoms and RoBT.

Inflation

A9.13 We propose to estimate the inflation assumption to be used in the WACC using RPI forecasts from HM Treasury. We consider that it is appropriate to calculate the nominal risk-free rate by reference to RPI because index-linked gilts, which are used to inform our estimate of the risk-free rate, are linked to RPI.

A9.14 Although we are proposing to use CPI in the charge control formula, this use of CPI relates to how the cap is set to get from current charges to the forecast cost-based charges at the end of the control period. The 2015 LLCC model itself forecasts costs in nominal terms and various input price trends are used. In the specific case

[293] Nominal RFR = ((1+RPI) x (1+ real RFR))-1.
[294] Paragraphs A10.31 to A10.85, March 2015 MCT Statement.
[295] We also considered evidence from dividend growth models though we placed limited weight on this evidence due to the use of subjective input parameters.
[296] Corporation tax rates available here: http://www.hmrc.gov.uk/rates/corp.htm
[297] Paragraphs A10.179 and A10.180, March 2015 MCT Statement.

of the cost of capital, this is built up from a real risk free rate informed by yields on RPI-linked gilts, and so we consider that it is consistent to generate a nominal WACC consistent with that index – i.e. using forecast RPI, rather than forecast CPI.

A9.15 In May 2015, HM Treasury published an RPI forecast of 3.2% for 2018 and 3.0% for 2019.[298] The weighted average of these forecasts for the financial year 2018/19, the final year of the charge control, is 3.2%. This forecast represents the average of a number of independent forecasts from City and non-City forecasters.

A9.16 We therefore propose to use an RPI forecast of 3.2% in our WACC calculation to derive the nominal RFR. Combined with our real RFR estimate of 1.0%, the nominal RFR is 4.2%.

A9.17 We note that this RPI forecast of 3.2% for the 2018/19 financial year is also used in our cost model where assets are inflated by RPI, for example copper and duct assets in the RAV model.

Equity beta – BT Group

A9.18 The equity beta can be thought of as the tendency of a company's returns to respond to changes in the market (and thus the systematic risk, or non-diversifiable risk, inherent in that company). The lower the equity beta, the less volatile are the company's returns relative to changes in the market. The equity beta reflects the underlying systematic risk of the firm without debt (asset beta) and the effect on risk of the firm's financing (its gearing).

A9.19 We propose to derive a forward-looking equity beta for BT Group using the following three steps:

- first, derive the equity beta for BT Group using BT's equity returns relative to market equity returns over the recent past;
- second, derive the asset beta for BT Group by removing the effect of financial gearing from the equity beta estimated in the preceding step; and
- third, derive a forward-looking equity beta by applying a forward-looking gearing rate for BT Group to the asset beta estimated in the preceding step.

Equity beta derived from market data

A9.1 We commissioned NERA to estimate BT Group's equity beta and that of comparator companies. The NERA report can be found at Annex 10. NERA estimated equity betas for BT Group against the FTSE All Share and FTSE All World indices, using 1-year and 2-year daily data up to 31 January 2015. Table A9.2 summarises NERA's estimates.

[298] Table M3, page 19, HM Treasury, *Forecasts for the UK economy: a comparison of independent forecasts*, May 2015, https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/428467/Forecasts_for_UK_economy_May_2015.pdf

Table A9.2: BT Group equity beta estimate

	FTSE All Share		FTSE All World		
	Equity beta	Standard error	Equity beta	Standard error	Average gearing
2-year	0.97	0.07	0.82	0.09	26%
1-year	0.85	0.08	0.73	0.12	23%

Source: Tables 3.1 and 3.2, NERA Report.

A9.2 In previous WACC calculations we have generally placed most weight on the equity beta calculated over a 2-year period because we consider that it provides the most appropriate balance between a short enough estimation period to remain relevant on a forward-looking basis, whilst having enough data points to be sufficiently statistically robust.

A9.3 When estimating the equity beta for BT we have generally placed most weight on equity betas calculated against the FTSE All Share index because it reflects what might be termed 'the home bias' of investors in domestically listed companies such as BT.[299] Furthermore, the FTSE All-Share is a well-diversified index with high levels of liquidity.

A9.4 Our preferred estimate of the BT Group equity beta is therefore 0.97, based on 2 years' worth of daily returns data, regressed against the FTSE All-Share index.

Calculating an asset beta from the equity beta

A9.5 Asset betas are calculated using the following formula:

$$\beta\ asset = Gearing * \beta\ debt + (1 - Gearing) * \beta\ equity$$

A9.6 NERA calculated asset betas by de-levering the observed equity betas using an average gearing ratio consistent with the time period for estimating the equity beta. For example, a 2-year equity beta was de-levered to an asset beta using the average 2-year gearing in the same period. NERA calculated the asset betas assuming a debt beta of zero and 0.10.

A9.7 Table A9.3 summarises NERA's estimates of the asset beta for BT Group.

[299] For example, the 2014 Legg Mason Global Investment Survey reports that, globally, 17% of investments are held outside of the home country (for the UK the figure is 18%). This indicates that over 80% of investments are made domestically. See page 17, Legg Mason, *2014 Legg Mason Global Investment Survey*, 2014, http://www.leggmason.com/globalthoughtleadership/410390-LGEN016205-2014-GIS-Summary-Brochure-A4-v4d.pdf.

Table A9.3: BT Group asset beta estimate

	FTSE All Share		FTSE All World		
	Debt beta = 0	Debt beta = 0.1	Debt beta = 0	Debt beta = 0.1	Average gearing
2-year	0.71	0.74	0.61	0.64	26%
1-year	0.65	0.67	0.56	0.58	23%

Source: Table 3.2, NERA Report.

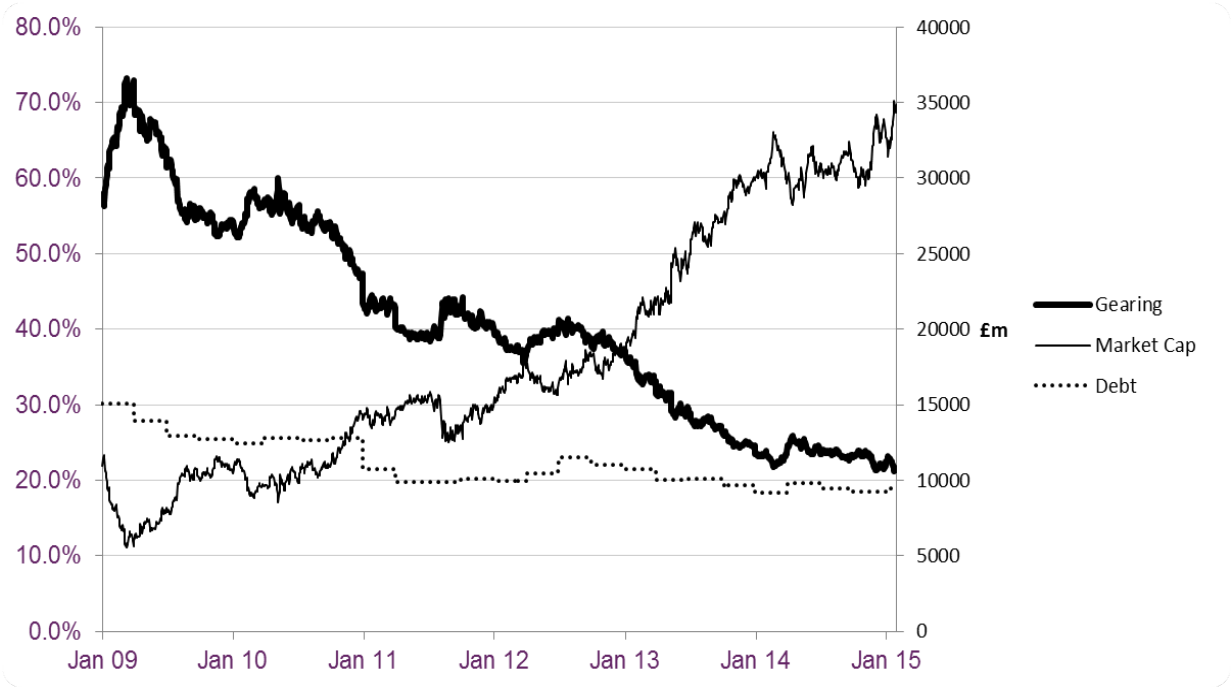
A9.8 We have used an asset beta for BT Group of 0.74. This is consistent with an equity beta for BT Group of 0.97, de-levered using average gearing of 26% and a debt beta of 0.1. A debt beta of 0.1 is consistent with our proposals in paragraphs A9.37 to A9.42.

Forward-looking gearing

A9.9 As illustrated in Figure A9.1 below, BT's gearing has fallen significantly in recent years and its current gearing level of 21%[300] is the lowest it has been for many years. The reduction in gearing has been driven by increases in BT's market capitalisation which has tripled since 2009, though debt levels have also reduced by around a third over the same period. Over the last six years (since the start of 2009 shown in Figure A9.1) BT's gearing has averaged around 40%. Since BT's current level of gearing is not typical of the levels we have seen over previous years, we have considered whether this would be an appropriate gearing to use on a forward looking basis.

[300] Based on its debt position as at 31 January 2015 and a market capitalisation at that point of £35bn. Note that NERA calculates debt in the gearing calculation as the sum of short term and long term debt. See page 7 of NERA Report.

Figure A9.1 BT Group's gearing, market cap and total debt



Source: Gearing data provided by NERA. Market capitalisation and debt from Bloomberg (debt equal to short term plus long term debt).

A9.10 One reference point is UK utilities. We would expect utility companies to be associated with lower levels of systematic risk than BT Group as a whole. In addition, companies with lower systematic risk will generally be able to support a higher level of debt. Gearing for the six utility companies considered by NERA currently averages around 40% and has averaged 46% over the six years to January 2015.[301] We would generally expect BT's gearing to be below that of utility companies.

A9.11 Another reference point is other UK telecommunication companies.[302] Over the last six years, gearing for both Sky and TalkTalk has averaged around 20%. TalkTalk's current gearing is 16% while Sky's is 33%.[303] We would expect that its ownership of Openreach (which we consider to be a stable and more utility-like part of the business with lower systematic risk) might allow BT to support a higher level of gearing than Other UK telecoms companies, although this could be offset by the greater systematic risk associated with other parts of BT's business such as Global Services.

A9.12 In the June 2014 FAMR Statement we used a forward looking gearing rate for BT of 32%, equivalent to its average gearing over the preceding two years at the time. In that statement, we recognised that the forward looking gearing we assume needs to be appropriate for both the regulated business (in the June 2014 FAMR Statement, Openreach) and other parts of BT since we have not previously tried to derive separate gearing levels for different parts of BT.

[301] Gearing is currently around 45% for National Grid, Severn Trent, Pennon and United Utilities while it is around 30% for Centrica and SSE.
[302] We consider TalkTalk and Sky here. Colt does not currently have any debt.
[303] Sky's gearing increased in 2014 following a bond issue to fund its acquisitions of Sky Deutschland and Sky Italia.

A9.13 In practice, it is difficult to calculate separate gearing rates for different parts of BT, although we would expect that a business with lower systematic risk such as Openreach would generally be able to support a higher level of debt than BT Group overall.[304] Given that the forward looking gearing rate we use needs to be appropriate for both the regulated businesses and the other parts of BT, we are reluctant to place significant weight on BT's current gearing of 21% given that it is particularly low by reference to gearing levels over a longer period.

A9.14 We consider that a reasonable forward looking gearing level for BT would currently lie between 20% and 40%. The low end of this range is comparable with that of UK telecoms operators while the upper end of the range is comparable to EU telecoms operators and is more typical for UK utilities. We note that it has been at least three years since BT's gearing has been at the top end of this range.[305]

A9.15 In light of the above, we propose a gearing level in the middle of this range and therefore consider that a gearing level of 30% represents a reasonable forward-looking estimate to calculate the BT Group WACC, and in turn, the WACCs for other parts of BT's business. This is also similar to the gearing of 32% assumed in the June 2014 FAMR Statement.

A9.16 In any case, the WACC calculation is not very sensitive to the assumed forward-looking gearing. For BT Group, the WACC is 10.0% pre-tax nominal for all gearing assumptions between 28% to 46%, assuming all other WACC parameters remain unchanged.

Proposal on forward-looking equity beta

A9.17 Combining our asset beta estimate of 0.74, our forward looking gearing estimate of 30% and our debt beta estimate of 0.1 (see next section) we derive a forward looking equity beta for BT Group of 1.01. This is calculated using the following formula:

$$\beta equity = \frac{\beta asset - \beta debt * Gearing}{1 - Gearing}$$

[304] The CC has previously noted: "*In our view, a business with lower systematic risk will generally be able to support a higher level of debt, although this depends on the overall risk of the business, including the company-specific risk of default on debt. We accept that a business exposed to lower overall risk may be able to target a higher credit rating, and hence a lower cost of raising finance, even at a higher level of indebtedness. However, there is no universally accepted model of an 'optimal' capital structure which would permit us to calibrate the relationship between risk and gearing with any precision*." (paragraph 2.366, Competition Commission, *References under section 193 of the Communications Act 2003: The Carphone Warehouse Group plc v Office of Communications, Case 1111/3/3/09 – Determination, 31 August 2010*, http://www.catribunal.org.uk/files/1.1111_Carphone_Warehouse_CC_Determination_310810.pdf)

[305] It was above 40% during the Global Financial Crisis when its enterprise value, along with many other companies, was depressed.

Debt beta

A9.18 There are significant practical difficulties in estimating debt betas robustly.[306] The Competition Commission (CC) has previously noted when trying to estimate debt betas:

> "*the regression-based approach was hampered by poor data quality and models with poor statistical properties*."[307]

A9.19 We have therefore considered other sources of evidence such as academic texts and previous CC determinations:

- Brealey, Myers and Allen in their textbook *Principles of Corporate Finance* estimate that debt betas of large firms are in the range of 0 to 0.2,[308] and
- the CC used a debt beta of 0.05 in the NIE Determination[309] and a debt beta of 0.1 in its 2007 Heathrow and Gatwick review and its 2010 Bristol Water review.[310]

A9.20 In both the June 2014 FAMR Statement and the March 2015 MCT Statement we used a debt beta of 0.1. We would associate a higher debt beta with relatively higher debt premiums and gearing levels, and vice versa. Table A9.4 shows the gearing levels and debt premiums we have used alongside our debt beta assumptions in recent decisions.

Table A9.4: Ofcom's recent debt beta, debt premium and gearing decisions

Year	Decision	Debt beta	Gearing	Debt premium range
2015	MCT Statement	0.10	40%	1% - 1.6%
2014	FAMR Statement	0.10	32%	1% - 1.5%
2013	LLCC Statement	0.15	40%	1.7% - 2.3%
2011	MCT Statement	0.10	30%	1% – 2%

Source: Ofcom[311]

A9.21 We explain how we have estimated our proposed debt premium range for BT Group of 1% - 1.4% in paragraphs A9.43 to A9.53 below. This is similar to the range we used for BT in the June 2014 FAMR Statement (i.e. 1.0% - 1.5%). As explained above, we propose to use a forward looking gearing rate of 30%. This is a little lower than the 32% we used in the June 2014 FAMR Statement. We do not consider that the gearing and debt premium levels we are proposing in this

[306] It is technically possible to calculate a beta of debt where the debt is traded by using the CAPM formula. However, equity values fluctuate more than the value of debt; therefore the correlation between debt returns and market returns is weak.
[307] See paragraph 7, Page L34, *Competition Commission report: Stansted Airport Ltd - Q5 price control review*, 'Appendix L: Cost of Capital', 23 October 2008. http://www.caa.co.uk/docs/5/ergdocs/ccstanstedl.pdf
[308] Page 436, Brealey, Myers and Allen, 2013, *Principles of Corporate Finance, 11th Edition*.
[309] Paragraph 13.175c, page 13-36, NIE Determination.
[310] CC report on Heathrow and Gatwick, Appendix F, paragraph 106. https://www.caa.co.uk/default.aspx?catid=5&pageid=8779 and CC Bristol Water Determination, Annex N, paragraph 151, http://webarchive.nationalarchives.gov.uk/20121212135622/www.competition-commission.org.uk/our-work/directory-of-all-inquiries/bristol-water-plc-water-price-limits-determination
[311] March 2011 MCT Statement, March 2015 MCT Statement (Table A10.1), 2013 LLCC Statement, and June 2014 FAMR Statement (Table A14.1 and Table A14.2).

consultation are sufficiently different to the levels we have assumed in the June 2014 FAMR Statement to justify the use of a different debt beta.

A9.22 Therefore, in light of the above, we consider it appropriate to assume the same debt beta of 0.1 as we used in the June 2014 FAMR Statement and the March 2015 MCT Statement.

A9.23 We note that the overall WACC calculation is not very sensitive to the assumed debt beta. Assuming other parameters were held constant, changing the debt beta by 0.05 would affect the BT Group pre-tax nominal WACC by 0.1 percentage points.

Debt premium

A9.24 In estimating BT's cost of debt we require two inputs:

- the nominal RFR (which we estimated at 4.2% earlier in this annex); and
- the debt premium.

A9.25 The debt premium represents the extra return that investors require as a reward for investing in BT's debt rather than a risk-free asset.

A9.26 We have estimated a debt premium for BT by considering the observed yields on sterling denominated debt for BT Group over and above benchmark UK government nominal gilt yields for gilts with the same maturity as BT's debt. We consider that recent estimates of the yield on sterling debt for BT Group are a good proxy for the efficiently incurred forward looking cost of debt to be included in the WACC estimate. We have also taken account of spreads on an index of BBB bonds over government gilts. For the purposes of determining a range for the debt premium we have considered debt spreads over the last twelve months so as not to give undue weight to a particular observation that may not be typical.

A9.27 Approximately 33% of BT's outstanding listed debt is sterling denominated, with 50% dollar denominated and the remainder Euro denominated. In this consultation we have focused on the spreads of BT's sterling denominated bonds. While we could also take account of the spreads of bonds denominated in other currencies, this would involve taking into account expectations of future exchange rates. We would not expect the currency denomination of the debt to have a material impact on the total cost of BT's bonds due to the opportunity for arbitrage.

A9.28 We have considered the sterling denominated debt of BT Group with both short-term and long-term maturity dates because we would expect BT to raise debt of varying maturities when considering its future financing requirements.[312] Table A9.5 lists the sterling debt we have considered alongside the average, minimum and maximum spread of this debt in the last 12 months over nominal UK government gilts.

[312] In the June 2014 FAMR Statement we focused on BT's debt maturing in June 2017 since the maturity date was close to the end of that charge control period in March 2017. However, in the March 2015 MCT Statement we considered that it was appropriate to take into account both short term and long term debt since we observe companies issuing debt of varying maturities in order to finance themselves.

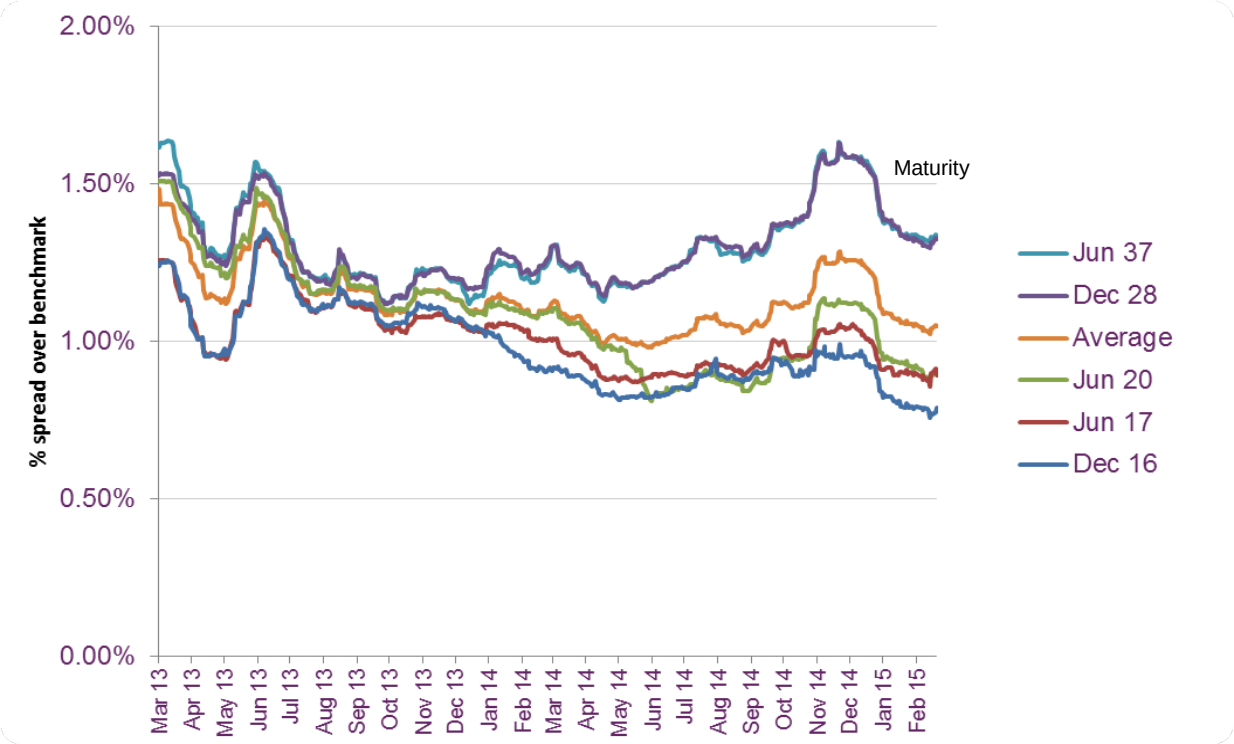
Table A9.5: Spread of sterling denominated debt over UK gilts for BT

Maturity date	Years to maturity	12 month average	12 month min	12 month max	Current (March 2015)
Dec-16	1.7	0.9%	0.8%	1.0%	0.8%
Jun-17	2.3	0.9%	0.9%	1.1%	0.9%
Jun-20	5.3	1.0%	0.8%	1.1%	0.9%
Dec-28	13.7	1.3%	1.1%	1.6%	1.3%
Jun-37	22.3	1.3%	1.1%	1.6%	1.3%
Average	9.1	1.1%	1.0%	1.3%	1.0%

Source: Bloomberg, Ofcom analysis. Average maturity is a simple average. All of these bonds have a Bloomberg Composite credit rating of BBB. Data to 17 March 2015.

A9.29 Longer term debt typically has a higher yield and spread than shorter term debt. While BT's outstanding sterling debt has different maturities, the simple average maturity is between 9 and 10 years.[313] Figure A9.2 charts the spread of BT's sterling debt over the last two years.

Figure A9.2: Spread of sterling denominated debt over UK gilts for BT



Source: Bloomberg, Ofcom analysis. Data to 27 March 2015.

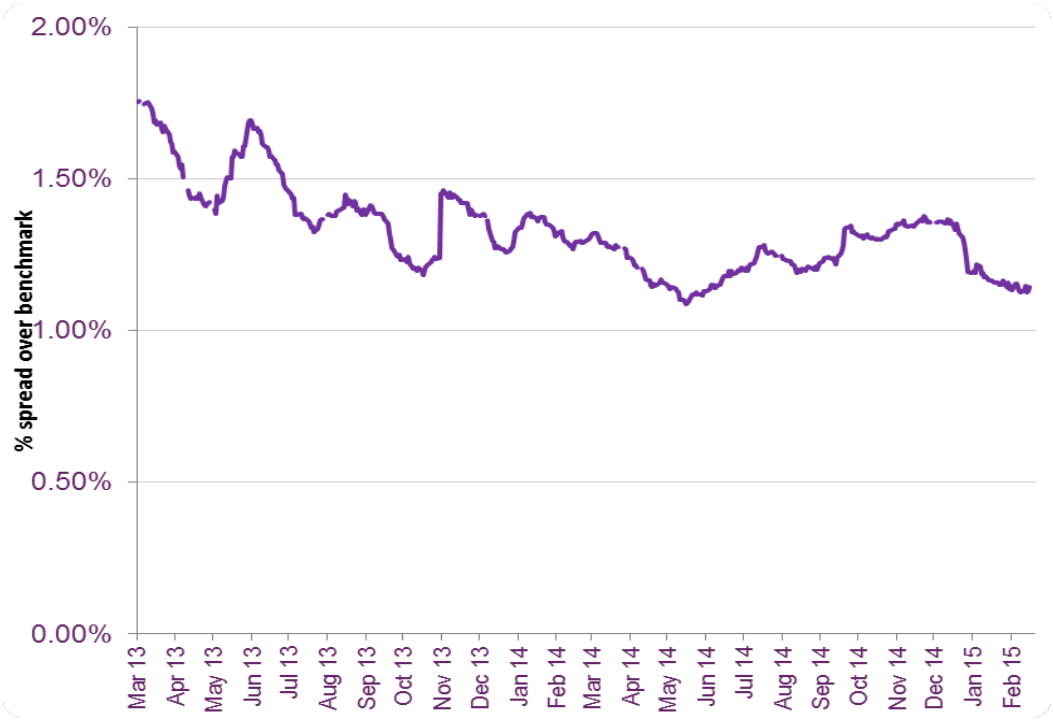
A9.30 Taken together the chart and preceding table show that the average debt premium for BT has been between 1% and 1.3% over the last 12 months, averaging 1.1%.

A9.31 We have also considered the spread of an index of BBB bonds over nominal gilts with a 10 year maturity. We have used BBB bonds since each of BT's sterling listed

[313] For BT's sterling debt, the weighted average tenor (weighted by amount issued) is currently similar to the simple average.

bonds has a Bloomberg composite rating of BBB[314] and we have considered bonds with 10 year maturities since this is broadly the average maturity of BT's listed debt.

Figure A9.3: Spread over nominal gilts of an index of 10-year BBB bonds



Source: Bloomberg, Bank of England, Ofcom analysis. BBB index is the BVCSGU10 Index from Bloomberg. Gilt data is taken from the Bank of England's 10 year spot yield curve. Spread is calculated as the difference between the yields of these two indices.

A9.32 Figure A9.3 shows the spread of an index of BBB bonds over UK gilts. Over the last 12 months this spread has ranged from 1.1% to 1.4%, with an average of 1.2%. This is slightly higher than the average spread of BT's bonds.

A9.33 Based on this spread data from BT's bonds and BBB bonds, we consider that a reasonable range for BT's debt premium is 1.0% to 1.4%. This range captures the minimum and maximum spread (averaged across all maturities) for BT's bonds and BBB bonds over the last year. For the purposes of calculating a BT Group WACC we have used 1.2%, the mid-point of this range. We discuss the disaggregated debt premium at the end of this annex.

A9.34 The resulting pre-tax nominal cost of debt for BT Group is 5.4%, representing the sum of the nominal RFR of 4.2% and the debt premium of 1.2%.[315]

[314] The Bloomberg composite rating takes into account the credit rating from different agencies - BT Group's credit rating is currently BBB from Standard & Poor's and Fitch, and Baa2 from Moody's. A Bloomberg composite rating of BBB- or higher indicates an investment grade bond.

[315] We recognise that this is above current yields to maturity on corporate debt issued by BT. This is a similar outcome to that observed in the March 2015 MCT Statement, where we explained that our preferred estimate of the real RFR was above current yields on index-linked gilts (and hence our estimate of the nominal RFR was above the yield on nominal gilts which provide the benchmark against which corporate bonds are typically compared to derive a spread). We estimated the cost of debt in this way because we considered it appropriate to take a consistent approach in estimating the cost of equity and cost of debt by assuming the same real RFR for both. We are seeking to set an overall return on capital required by investors to finance significant, and in some cases risky or long-lived, investments. In doing so, we consider that arguments over the appropriate real RFR to

Disaggregation of BT Group's asset beta

Introduction

A9.35 Our approach to estimating asset betas for different parts of BT was developed in the August 2005 WACC Statement. In this statement we set out our approach to estimating asset betas for different parts of BT to reflect variations in systematic risk between different activities. We concluded that it was appropriate to estimate a separate asset beta for BT's copper access business (which we refer to as 'Openreach') and to have another asset beta for the RoBT.[316] We applied weights to these two asset betas such that their weighted average was equal to the BT Group asset beta.

A9.36 Since the August 2005 WACC Statement, charge controls relating to copper access products (e.g. LLU, WLR and ancillary services) have used a WACC derived from the 'Openreach' asset beta, while all other charge controls, including those for leased lines, have used the RoBT asset beta.

A9.37 Therefore, in the July 2009 LLCC Statement and the March 2013 BCMR Statement, we applied the RoBT asset beta to leased lines for the purposes of calculating the WACC.[317] These decisions to use the RoBT asset beta were based on the view that leased lines services should not be classified alongside BT's copper access network for the purposes of an assessment of systematic risk levels. Since the downstream leased lines services from which the demand for wholesale services is derived are mostly used by corporate customers and other CPs, we considered that future demand for these services, particularly in the case of the demand for new circuits, was likely to be more closely correlated with general economic activity than other access services.[318] In the appeal of the 2009 LLCC Statement, the CC agreed that demand for the Openreach copper access business would be less sensitive to the economic cycle than leased lines.[319]

A9.38 In the following paragraphs we first consider the Openreach copper access asset beta before considering whether it remains appropriate to apply the resulting RoBT asset beta to leased lines services.

An Openreach copper access asset beta of 0.50 remains appropriate

A9.39 In the June 2014 FAMR Statement, we used an asset beta of 0.50 for Openreach copper access. We have therefore considered whether for this consultation an Openreach copper access asset beta of 0.50 remains appropriate for the purposes of disaggregating the BT Group asset beta. Using data to 31 January 2015, NERA

---

use in the WACC should apply equally to debt and equity and we seek to maintain a consistent approach to estimating these – both through time and between market reviews.

[316] The Openreach division of BT provides copper access services (LLU and WLR), Ethernet leased lines and fibre access. However, we use the short-hand 'Openreach' to refer to services delivered over the copper access network, i.e. LLU, and WLR services, in our discussions of disaggregation of the BT Group WACC.

[317] Prior to that, the WACC applied to leased lines was the BT Group WACC which was estimated using the BT Group asset beta. For example the 2004 PPC Charge Control used a pre-tax nominal WACC for BT Group of 13%. See pages 107 to 120, September 2004 LLCC Statement.

[318] See, for example, paragraph 3.262 of the 2009 LLCC Statement and paragraphs A14.123 to A14.130 in the 2013 LLCC Statement.

[319] See paragraphs 4.308 to 4.314 of Competition Commission, *Cable & Wireless UK v Office of Communications*. *Case 1112/3/3/09 - Determination*, 30 June 2010, http://www.competition-commission.org.uk/assets/competitioncommission/docs/pdf/non-inquiry/appeals/communications_act/final_determination_excised_version_for_publication

has estimated the asset betas for UK network utilities as well as UK, European and US telecoms companies. The tables below summarise the asset betas calculated by NERA against the 'home' index (as far as possible)[320] using a debt beta of 0.1.

Network utilities

A9.40 NERA has calculated that the 2-year asset beta for six network utilities ranged from 0.31 to 0.52 with an average of 0.40.

Table A9.6: asset betas for network utilities

	Asset beta v All Share		Average gearing	
Company	**1 year**	**2 year**	**1 year**	**2 year**
National Grid	0.44	0.41	44%	47%
Severn Trent	0.43	0.38	50%	52%
Pennon Group	0.33	0.31	48%	50%
United Utilities	0.40	0.34	52%	54%
Centrica	0.61	0.52	29%	26%
SSE	0.44	0.45	30%	30%
Average	0.44	0.40	42%	43%

Source: NERA Table 3.2. Calculated using a debt beta of 0.1 using data up to 31 January 2015. Note that higher asset betas for Centrica and SSE may reflect the fact these companies do not have significant regulated transmission and distribution operations.

UK telecoms operators

A9.41 NERA has calculated that the 2-year asset beta for UK telecoms operators ranged from 0.55 to 0.75 with an average of 0.65.

Table A9.7: asset betas for UK fixed telecoms operators

	Asset beta v All Share		Average gearing	
Company	**1 year**	**2 year**	**1 year**	**2 year**
TalkTalk	0.58	0.65	15%	15%
Sky	0.61	0.55	18%	18%
Colt	0.74	0.75	0%	0%
Average	0.64	0.65	17%	17%

Source: NERA Table 3.2. Calculated using a debt beta of 0.1 using data up to 31 January 2015.

[320] For UK companies the 'home' index used is the FTSE All Share. For European companies it is the FTSE All Europe and for US companies it is the S&P500.

European telecoms operators

A9.42 NERA has calculated that the 2-year asset betas for European telecoms operators ranged from 0.35 to 0.56 with an average of 0.44.

Table A9.8: asset betas for European telecoms operators

	Asset beta v All Europe		Average gearing		Non-mobile revenue %
Company	1 year	2 year	1 year	2 year	
Telefonica	0.53	0.50	52%	54%	34%
Deutsche Telecom	0.55	0.44	48%	51%	n/a
Belgacom	0.52	0.43	22%	24%	63%
KPN	0.52	0.37	55%	64%	33%
Orange	0.69	0.53	54%	59%	39%
Telecom Italia	0.46	0.37	70%	74%	68%
Illiad	0.82	0.56	10%	11%	34%
Mobistar	0.31	0.35	37%	37%	10%
Telenor	0.61	0.48	22%	22%	16%
Tele2	0.52	0.42	21%	21%	28%
Swisscom	0.42	0.38	27%	27%	44%
Average	0.54	0.44	38%	40%	

Source: NERA Table 3.4. Calculated using a debt beta of 0.1 using data up to 31 January 2015. Non-mobile revenue used as an illustrative proxy for revenue derived from mobile operations.

US telecoms operators

A9.43 NERA has calculated that the 2-year asset beta for US telecoms operators ranged from 0.41 to 0.76 with an average of 0.54.

Table A9.9: asset betas for US telecoms operators

	Asset beta v S&P500		Average gearing		Non-mobile revenue %
Company	1 year	2 year	1 year	2 year	
AT&T	0.42	0.47	31%	29%	46%
Verizon	0.43	0.45	35%	34%	33%
Time Warner Cable	0.68	0.60	38%	42%	n/a
Comcast	0.78	0.76	42%	26%	n/a
Century Link	0.39	0.41	50%	50%	n/a
Average	0.54	0.54	39%	36%	

Source: NERA Table 3.6. Calculated using a debt beta of 0.1 using data up to 31 January 2015. Non-mobile revenue used as an illustrative proxy for revenue derived from mobile operations.

Openreach copper access asset beta

A9.44 The Openreach copper access asset beta of 0.50 lies between the average network utility asset beta of 0.40 and the current BT Group beta of 0.74. In addition, it lies below the average asset beta for UK fixed telecoms companies, which is consistent with our a priori expectation expressed in the June 2014 FAMR Statement.[321] For the purposes of this consultation, we consider that it remains appropriate to use an asset beta of 0.50 for Openreach copper access. We will review the latest evidence on asset betas for the 2016 BCMR Statement, including from overseas comparators.

We propose to reduce the weighting applied to Openreach copper access to 25%

A9.45 In the June 2014 FAMR Statement we assigned a weighting of 33% to BT's Openreach copper access business. This was based on a consideration of the proportion of BT Group represented by Openreach copper access in terms of Mean Capital Employed (MCE), Earnings Before Interest, Taxation, Depreciation and Amortisation (EBITDA) and the ratio of Net Replacement Cost (NRC) to enterprise value (EV).[322] We considered values for these weightings between 2010/11 and 2012/13. We considered that a weighting based on MCE was likely to overstate the economic value of Openreach copper access compared to the RoBT. We therefore placed more weight on the other two measures.

A9.46 Table A9.10 reports for 2012/13 and 2013/14 updated weightings based on MCE, EBITDA and NRC/EV for Openreach copper access as a proportion of BT Group.

Table A9.10: Weighting approaches for Openreach copper access

	2012/13	2013/14
MCE	61%	55%
EBITDA	28%	25%
Regulatory NRC/EV	29%	23%

Source: Ofcom.[323]

A9.47 We continue to place less weight on the MCE approach for the reasons given in the June 2014 FAMR Statement. The slight reduction in the EBITDA weighting for Openreach copper access in 2013/14 reflects the improved performance elsewhere in the business, in particular BT Global Services. The larger reduction in the regulatory NRC/enterprise value weight reflects the fact that BT's enterprise value increased by over 20% in 2013/14; an increase which we consider is more likely to be driven by higher economic value associated with the rest of BT's business rather than the copper lines business.

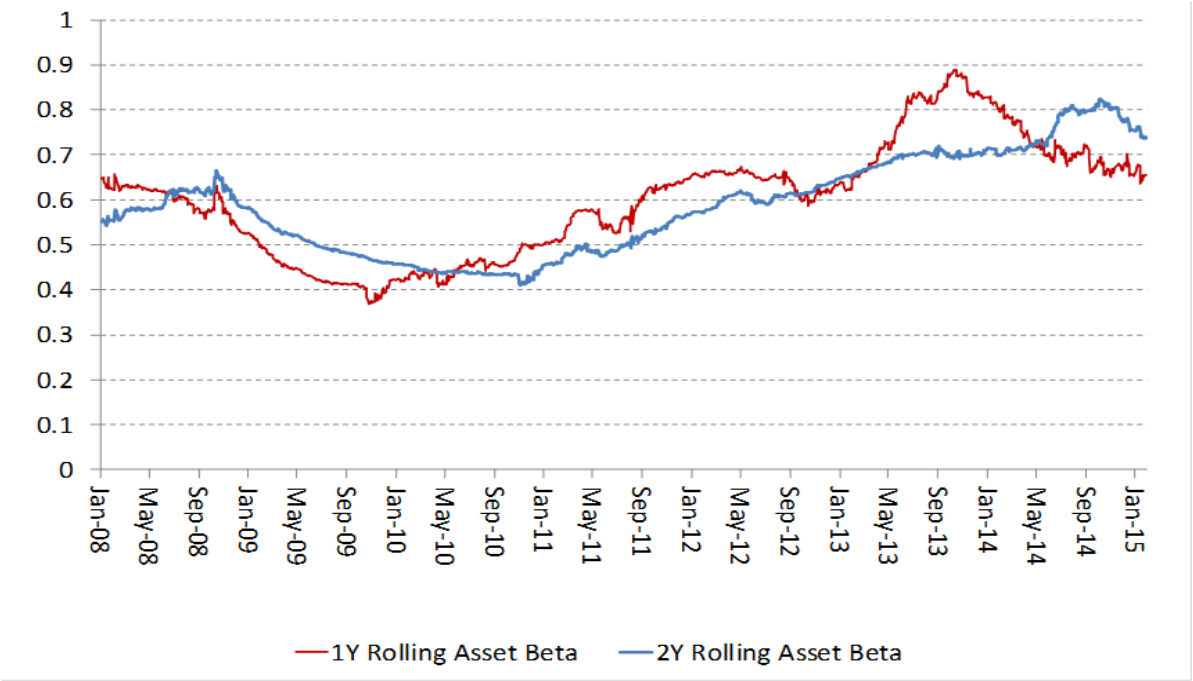
[321] Paragraph A14.218, June 2014 FAMR Statement.
[322] Table A14.17 and paragraphs A14.289 to A14.292, June 2014 FAMR Statement.
[323] MCE is derived from information reported in BT's RFS. 'Openreach copper access' includes MCE associated with WLR and WLA markets (as reported in the RFS) and a proportion of 'Other Openreach markets and activities' that we estimate relates to internal SMPF. EBITDA is estimated using information reported in BT's RFS (specifically the 'performance summary by market table'), with EBITDA equal to total revenue less HCA operating costs less depreciation. Total EBITDA is equal to that reported in BT's annual report. NRC is taken from the cost model supporting the June 2014 FAMR Statement divided by BT's enterprise value as at the year-end as reported by Bloomberg.

A9.48 In estimating the relevant weightings, we propose to consider the same period as used for estimating the BT Group asset beta – i.e. the last two years. On that basis, and with little weight placed on the MCE data, we consider that an appropriate weighting for the copper access business for the purposes of this consultation is around one-quarter, down from the one-third weighting used in the June 2014 FAMR Statement.

The RoBT asset beta may not be appropriate to use for leased lines

A9.49 The BT Group asset beta has increased in recent years, as illustrated in Figure A9.4.

Figure A9.4: BT rolling 1 year and 2 year asset beta against the FTSE All Share



Source: NERA Figure 4.1.

A9.50 With an increasing BT Group beta and an unchanged Openreach copper access beta, the implied RoBT beta will increase. Given a current BT Group asset beta of 0.74, an Openreach copper access asset beta of 0.50 and a weighting of 25%, the implied RoBT asset beta is 0.82. This is higher than the RoBT asset beta applied to leased lines in the 2009 and 2013 charge controls.

A9.51 As explained below, we think it would be inappropriate to apply an asset beta of 0.82 to leased lines for the following reasons:

- we do not consider that the systematic risk of leased lines is likely to have increased since the March 2013 BCMR Statement;
- the possible explanations for the increase in the BT Group asset beta do not appear to relate to leased lines; and
- an asset beta of 0.82 would be higher than that for other UK, European or US telecoms comparator companies.

The systematic risk of leased lines has not obviously increased since the March 2013 BCMR Statement

A9.52 The RoBT asset beta of 0.82 is higher than the asset betas used in the July 2009 LLCC Statement and the March 2013 BCMR Statement of 0.68[324] and 0.74 respectively.[325] It is not obvious to us that the systematic risk of providing leased lines services has changed significantly since the March 2013 BCMR Statement. The main development in the leased lines market has been the transition from TI to AI and WDM services. However, we would not expect this to result in significant changes to the systematic risk faced by the leased lines business overall since customers are largely substituting one technology for another.

A9.53 We have also considered whether BT's volume data for leased lines would support an argument that the exposure of leased lines to systematic risk has increased. Increasing volume variance or reduced forecast accuracy may support such an argument.[326] However, as summarised in Table 9.11 below the variation in leased lines monthly rental volumes has been fairly stable over the last four years, with the difference between the maximum and minimum monthly rental volume being between [✂] and [✂]. In addition, it is difficult to conclude that forecasting uncertainty has increased over the last four years. Although forecasts did seem more accurate in 2011/12 and 2012/13 than 2013/14, in 2013/14 they were more accurate than in 2010/11.

Table A9.11: Variation and forecast error for leased lines rental volumes

	2010/11	2011/12	2012/13	2013/14
Max/Min monthly difference	[✂]	[✂]	[✂]	[✂]
Forecast error	[✂]	[✂]	[✂]	[✂]

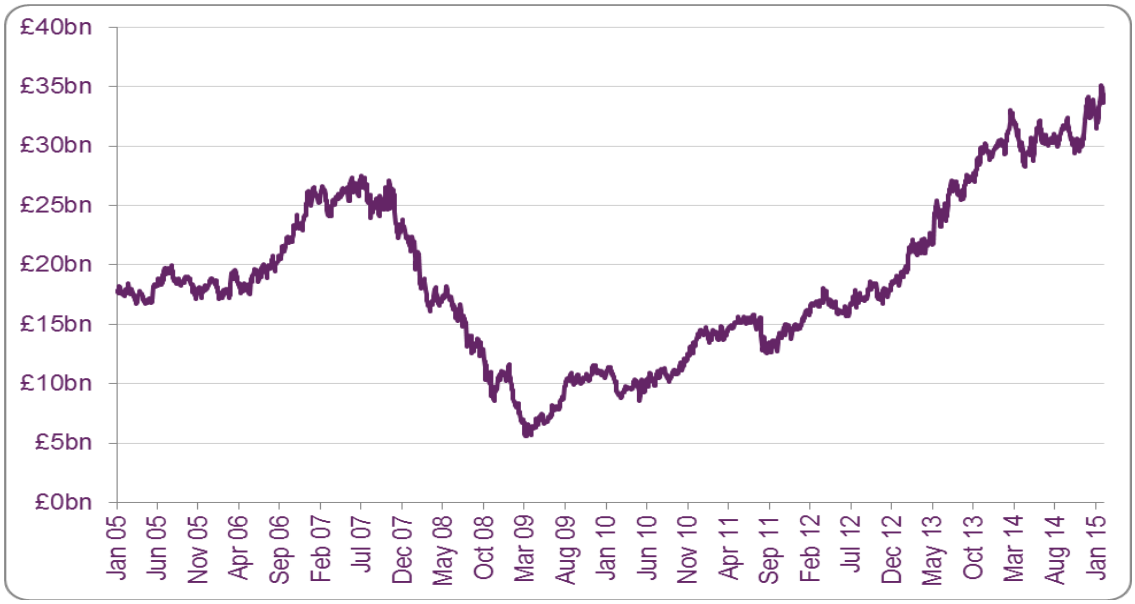
Source: Ofcom analysis of BT response dated 24 October 2014 to question A1 of the section 135 response dated 21 October 2014.[327]

The possible explanations for the increase in the BT Group asset beta do not appear to relate to leased lines

A9.54 As set out in Figure A9.4, BT Group's 2-year asset beta has been steadily increasing since late 2010, and has only recently started to decline. The 1-year asset beta started to increase before this, around late 2009. This increase in the BT Group asset beta has coincided with an increase in BT's market capitalisation. As shown in Figure A.9.5 below, BT's market capitalisation has increased steadily since early 2009 and the 1 year rolling asset beta began to increase from late 2009 (and given the lag due to a 1 year rolling average suggests the increase in the asset beta and the market capitalisation are closely correlated).

[324] The 2009 LLCC Statement used the same RoBT asset beta as calculated in Ofcom, *A new pricing framework for Openreach – Annexes*, Statement, 22 May 2009, http://stakeholders.ofcom.org.uk/binaries/consultations/openreachframework/statement/annexes.pdf. That document sets out that the equity beta for RoBT was 0.96 with a gearing rate of 35% and a debt beta of 0.15. Solving for the asset beta using the equation at paragraph A9.24 gives an asset beta for RoBT of 0.68.
[325] Figure A14.1, page 348, March 2013 BCMR Statement.
[326] Volume data is also likely to reflect changes in specific risk as well as systematic risk, so requires interpreting with caution (since we are concerned with reflecting systematic risk, not specific risk, in the asset beta).
[327] The max/min monthly difference shows the percentage difference between the highest and lowest monthly volume in each year. Forecast error shows the percentage difference between the actual volume and BT's forecast at the start of the year. A positive number indicates that the actual volume was higher than the forecast.

Figure A9.5: BT market capitalisation £bn



Source: Bloomberg

A9.55 The increase in BT Group's asset beta could have been caused by BT Group generally facing greater systematic risk, or the riskier parts of BT could be growing, i.e. the parts of the business causing BT's market's capitalisation to increase could face greater systematic risk than the group as a whole.

A9.56 NERA identified a number of factors that could have contributed to the BT Group asset beta increasing, but it is difficult to be definitive on a single factor that could explain an increase in the asset beta from around 0.40 in 2009 and 2010 (depending on whether the 1-year or 2-year rolling betas are considered) to more than 0.80 in 2013 (on the 1-year asset beta), or in 2014 (on the 2-year asset beta).

A9.57 The factors identified by NERA as potentially contributing to the increase in the BT Group asset beta from 2010 to 2014 are as follows:

- **profit growth in Global Services.** Following profit warnings in 2008 and 2009, Global Services' (BT's ICT and managed networked IT services division) share of BT Group EBITDA has been increasing, from around 5% of EBITDA in 2009 to 15% in 2014. NERA says that "*this could have been contributing to an increase in BT Group's overall asset beta, to the extent that the [Global Services] unit would be exposed to higher systematic risk than other parts of BT".* Evidence on asset betas for companies providing ICT services similar to BT's Global Services division indicates that asset betas for ICT companies are higher on average than the asset betas for companies providing more standard telecoms connectivity services (see paragraphs A9.100 and A9.101);

- **move into pay TV and investments in sports rights.** NERA says that "*the increase in BT's [asset] beta around the BT sport investments could have been driven by the perception of the riskiness of this investment, given that it entailed entry into a competitive market where BT would have to carve its market share from established incumbents such as Sky and others*".[328] However, more recently BT's asset beta has been trending downwards and a contributor to this may be

[328] NERA report, page 33.

that "*market perception of the riskiness of BT Sport may have declined, due to BT establishing a stable share in the content market and engaging in successful rights auctions*";[329]

- **investment in fibre to the cabinet (FTTC).** BT made its first large FTTC investments in July 2008 and announced further investments in May 2010. NERA says that "*the [FTTC investment] programme was capital intensive and the cashflows that were to be generated with the fibre investment may well have been perceived to be subject to greater risk than other investments in Openreach – i.e, the FTTC network was a new product, intended to deliver higher speed and better quality of service, albeit also at a higher price. In that sense, at least during its introductory phase, the FTTC investment could have been perceived as having a high income elasticity and therefore greater systematic risk."*[330] NERA considers that the decline in BT's asset beta over the 2008-2010 period is "*more likely to be associated with changes in perceptions of relative risk following the Global Financial Crisis*";[331] and

- **changes to the defined benefit pension scheme.** BT runs one of the largest defined benefit pension schemes in the UK[332]. NERA notes that "*an emerging academic literature exists which documents empirical findings that equity risk may reflect the riskiness of a company's pension plan. According to this literature, the net risk contributions from a company's pension plan are crucially driven by (1) the relative value of the pension assets to operating assets of the business (i.e. debt and equity net of the difference between pension assets and pension liabilities), and (2) the relative systematic risk (quantified by the beta parameter) of the pension assets and liabilities. Our empirical assessment suggests that BT's ratio of pension assets to operating assets has been increasing in the last several years, which according to this literature would imply an increasing risk contribution from the pension scheme. However, the size of the effect of the pension scheme on a company's asset beta is uncertain and difficult to estimate. We also note that Ofcom's December 2010 Pension Statement may have contributed as a (short-term) trigger event of an increase in the beta, in confirming deficit repair payments would not be reflected in regulated charges and that Ofcom would not adjust the WACC for BT's pension scheme"*.[333]

A9.58 None of the factors potentially explaining the increases in the BT Group asset beta relate directly to leased lines. While it is plausible that some of these factors may have indirectly affected the asset beta of BT's leased lines business (e.g. if fibre broadband creates more substitution possibilities for customers previously taking leased lines, or if investor perceptions of risk due to the defined benefit pension scheme affect all parts of BT's business) this is not particularly supported by the volume evidence considered in the previous section. In relation to the other factors, we would not expect the improvement in the performance of Global Services and investments in pay TV and sports rights to affect the asset beta of leased lines services – and we note NERA's comments in relation to the latter that this effect may, in any case, be diminishing as BT's pay-TV and sports broadcasting business matures.

[329] NERA report, page 37.
[330] NERA report, page 31.
[331] NERA report, page 32.
[332] NERA report, page 32.
[333] NERA report, page 32.

An asset beta of 0.82 would be higher than that for other UK, European or US telecoms comparator companies

A9.59 An asset beta of 0.82 would be higher than any other asset beta for comparator telecoms operators, as summarised in table A9.12.

Table A9.12: 2 year asset betas for telecoms comparators

	Min	Max	Average
UK telecoms	0.55	0.75	0.65
European telecoms	0.35	0.56	0.44
US telecoms	0.41	0.76	0.54

Source: NERA

A9.60 Given the above evidence, we do not consider that it would be appropriate to apply the RoBT asset beta of 0.82 to leased lines. Therefore, we consider in the next section whether it is appropriate to disaggregate the BT Group asset beta further, in order to find a more appropriate asset beta to apply to the leased lines business.

Disaggregation framework

A9.61 In the August 2005 WACC Statement we explained that the case for disaggregating the asset beta is likely to be stronger under the following circumstances:

- there are a priori reasons for thinking that the systematic risk faced by the project is different from that faced by the overall company;
- there is evidence which can be used to assess variations in risk, e.g. benchmark firms that are close to pure play comparators or other quantitative analysis; and
- correctly identifying variations in risk, and reflecting this in an adjusted rate of return, is likely to bring about gains for consumers.[334]

A9.62 In the following section, we apply this framework to the question of whether it is appropriate to disaggregate the BT Group asset beta further.

There are a priori reasons for thinking that the systematic risk faced by leased lines is different from that faced by the overall company

A9.63 Leased lines are a relatively small part of BT Group by revenue (c. 6%) though they represent a larger proportion in terms of profits and mean capital employed. Given the relatively low weighting of leased lines within BT Group, the BT Group asset beta would not be expected to reflect the asset beta associated with leased lines to a large extent.

[334] Paragraph 5.24, August 2005 WACC Statement.

Table A9.13: leased lines operations as proportion of BT Group

	2012/13	2013/14
Revenue	6%	6%
EBITDA	12%	10%
MCE	16%	15%
NRC/EV	7%	7%

Source: Ofcom[335]

A9.64 In the May 2015 BCMR Consultation we identified the main users of leased lines as:[336]

- enterprise customers; and
- Mobile Network Operators (MNOs) and Local Loop Unbundling (LLU) operators.

A9.65 We are not aware of an established body of literature on the income elasticity of demand from such users, in contrast to that used to inform our earlier decisions which led to disaggregating BT's copper lines business from the rest of BT.[337] For example, in our first consultation document supporting the August 2005 WACC Statement we referred to two books, *The Future of the Telecommunications Industry: Forecasting and Demand* by David G. Loomis and Lester D. Taylor (Eds.) and *Telecommunications Demand in Theory and Practice* by Taylor, L. D. (1994).[338] We said that "*in these books, a large number of studies carried out over three decades in North America and Europe showed that, on average, the income elasticity of demand for access is significantly lower than the corresponding elasticities for various call types*".[339] Also, we note the 2005 paper by Garbacz and Thompson which found that in developed countries business users have a higher income elasticity of demand for access than residential users: 0.416 compared to 0.205.[340]

A9.66 In some cases, we consider that leased lines may share some of the demand-side characteristics of copper access lines. For example, demand to have a leased line connection providing backhaul for broadband providers may be reasonably stable since it provides an important part of the broadband provider's network. However, where leased lines can differ from access lines is that customers can scale the bandwidth they use according to demand and add or subtract sites/premises

[335] Revenue and MCE derived from RFS (total revenue and MCE for business connectivity markets divided by total markets revenue and MCE). EBITDA for business connectivity markets calculated as total revenue less operating costs less HCA depreciation. This is then divided by BT Group EBITDA reported in statutory accounts. NRC in 2012/13 has been taken from the Cost Model for the 2013 LLCC while the NRC for 2013/14 has been taken from the Cost Model for the current LLCC. EV is BT Group's enterprise value at the end of the year.
[336] Paragraphs 3.3 to 3.11, May 2015 BCMR Consultation.
[337] The income elasticity of demand measures the responsiveness of demand to changes in income. Services with low income elasticity would be expected to exhibit lower systematic risk compared to services with higher income elasticity, other things equal. This is because demand would not be expected to vary much over the macroeconomic cycle.
[338] The work by Taylor is summarised on pages B9 and B10 in Intven, H, Olivier, J and Sepulveda, E, *Telecommunications Regulation Handbook*, http://www.itu.int/ITU-D/treg/Documentation/Infodev_handbook/7_Appendix.pdf.
[339] Paragraph 5.38., August 2005 WACC Statement.
[340] Garbacz, C and Thompson, H, *Universal telecommunication service: A World perspective,* 20 April 2005*, http://teams/sites/kc/elib/topic/Economics/Universal%20Telecommunications%20Service%20A%20World%20Perspective%20Garbacz%202005.pdf.*

according to the macroeconomic cycle (particularly relevant in respect of business sites if not switch or mast sites of, respectively, fixed and mobile networks). The usage of leased lines (beyond a minimum level of connectivity) would therefore be expected to have higher income elasticity than copper access lines (particularly those for residential customers). We therefore consider that leased lines are more likely to share the risk characteristics of telecoms usage services such as voice and broadband, than the risk characteristics of fixed access lines themselves.[341] We consider this in more detail in the section below.

A9.67 We would also expect the systematic risk faced by leased lines, fixed voice and broadband services to be lower than for other services offered by BT, in particular the ICT services provided by Global Services. BT Global Services provides managed network IT services for large businesses and government organisations in the UK and overseas. In its 2005 report PwC said that "*it seems likely that demand for these [ICT] services will fluctuate considerably across the economic cycle, with businesses having some discretion over their demand for such services. Although operational gearing may be relatively low, we would expect this business to have a relatively high beta*".[342]

Evidence to assess variations in risk

A9.68 Under the previous heading we considered that on a priori grounds, the asset beta for leased lines would likely be above that for Openreach copper access, and broadly similar to other fixed voice and broadband services (fixed telecoms usage services). We considered that the asset beta for these fixed telecoms usage services (including leased lines) would be below that of ICT companies.

A9.69 Under this heading we now consider:

- evidence that fixed telecoms usage services face higher systematic risk than fixed access lines;
- evidence to estimate the asset beta for leased lines and telecoms usage services;
- evidence on the asset beta for ICT companies; and
- asset beta weightings.

Evidence that fixed telecoms usage services face higher systematic risk than fixed access lines

[341] The CC agreed with this view in its 30 June 2010 Determination of *Cable & Wireless UK v Office of Communications,* saying at paragraph 4.314 that "*it is our view that C&W has not provided convincing evidence to show that Ofcom was wrong to think that demand for leased lines would exhibit greater correlation to the economic cycle than demand for Openreach services. We consider Ofcom and BT to have made stronger arguments in support of Ofcom's position that it was likely that businesses would reduce their consumption of leased lines (for example, by reducing the number of leased lines purchased, or reducing the amount of bandwidth purchased) in response to a downturn in the economy, and that it was less likely that residential customers would dispense with their single broadband connection when faced with a similar downturn. All other things being equal, we consider this to support Ofcom's argument that this would tend to make the cash flows of the leased lines more variable and result in a higher cost of capital*".

[342] Page 14, PwC, Disaggregating BT's Beta: A report prepared for Ofcom by PricewaterhouseCoopers LLP, June 2005, http://stakeholders.ofcom.org.uk/binaries/consultations/cost_capital2/annexes/disaggregating.pdf (2005 PwC report).

A9.70 As noted above, we are not aware of any empirical studies on the income elasticity of leased lines but previous studies have indicated that usage (such as voice calls) is more income elastic than access. For example, in its 2005 report for Ofcom, PwC said that "*it seems reasonable to anticipate that call volumes [i.e. usage] will fluctuate more in response to changing economic circumstances, because businesses and individuals are more likely to react to changes in business activity and incomes by altering their immediate pattern of consumption of telecommunications services than by changing their consumption of access*".[343]

A9.71 We have also considered the monthly variability of BT's rental and call volume data for certain products and BT's volume forecast accuracy. We obtained data from BT for each financial year 2010/11 to 2013/14. The data relating to rental volumes and call minutes is summarised in Table A9.14 and A9.15.[344]

Table A9.14: Monthly maximum/minimum difference for BT actual rental and call volumes

	2010/11	2011/12	2012/13	2013/14	Average
Copper lines (WLR, LLU)	[✂]	[✂]	[✂]	[✂]	[✂]
Other copper lines (incl ISDN2)	[✂]	[✂]	[✂]	[✂]	[✂]
ISDN30	[✂]	[✂]	[✂]	[✂]	[✂]
Leased lines	[✂]	[✂]	[✂]	[✂]	[✂]
WBA	[✂]	[✂]	[✂]	[✂]	[✂]
Fibre BB	[✂]	[✂]	[✂]	[✂]	[✂]
Call minutes	[✂]	[✂]	[✂]	[✂]	[✂]

Source: Ofcom analysis of BT response dated 24 October 2014 to question A1 of the section 135 notice dated 21 October 2014.

Table A9.15: Forecast volume variability against actual rental and call volumes

	2010/11	2011/12	2012/13	2013/14	Average
Copper lines (WLR, LLU)	[✂]	[✂]	[✂]	[✂]	[✂]
Other copper lines (incl ISDN2)	[✂]	[✂]	[✂]	[✂]	[✂]
ISDN30	[✂]	[✂]	[✂]	[✂]	[✂]
Leased lines	[✂]	[✂]	[✂]	[✂]	[✂]
WBA	[✂]	[✂]	[✂]	[✂]	[✂]
Fibre BB	[✂]	[✂]	[✂]	[✂]	[✂]
Call minutes	[✂]	[✂]	[✂]	[✂]	[✂]

Source: Ofcom analysis of BT response dated 24 October 2014 to question A1 of the section 135 notice dated 21 October 2014. A positive number means that the actual volume was greater than BT's forecast at the start of the year.

[343] Page 11, Disaggregating BT's Beta, June 2005.
[344] We focus on rental volumes since they represent a larger proportion of revenues than connection volumes.

A9.72 The data indicates that:

- Openreach copper access rental volumes showed almost no monthly variability and could be forecast by BT with a good degree of accuracy;
- volume data for leased lines rentals was more variable than Openreach copper access services and slightly more difficult to forecast;[345] and
- the variability of call volumes and rental volumes for other regulated services (WBA, ISDN2, ISDN30) is also higher than Openreach copper access services and broadly similar to leased lines.

A9.73 There are however limitations with this evidence:

- it can only give an indication of total risk, i.e. systematic risk and company specific risk combined. This is illustrated by the data for fibre broadband which appears to show a lot of monthly variability but this may be a result of the fact it is a growing business rather than an indicator that it faces higher systematic risk than BT's fixed voice and current generation broadband services; and
- volume data is not available on a consistent/comparable basis across all BT businesses. For example we do not have a unit of volume for TV content or Global Services. The data therefore excludes BT's operations concerning content, consultancy and international ICT services.

A9.74 For these reasons, we consider that this evidence is a useful qualitative indicator of the risk of leased lines and other fixed telecoms usage services compared to Openreach copper access, but it is not sufficiently robust to estimate a unique beta at a much more granular level.

Evidence to estimate the asset beta for leased lines and fixed telecoms usage services

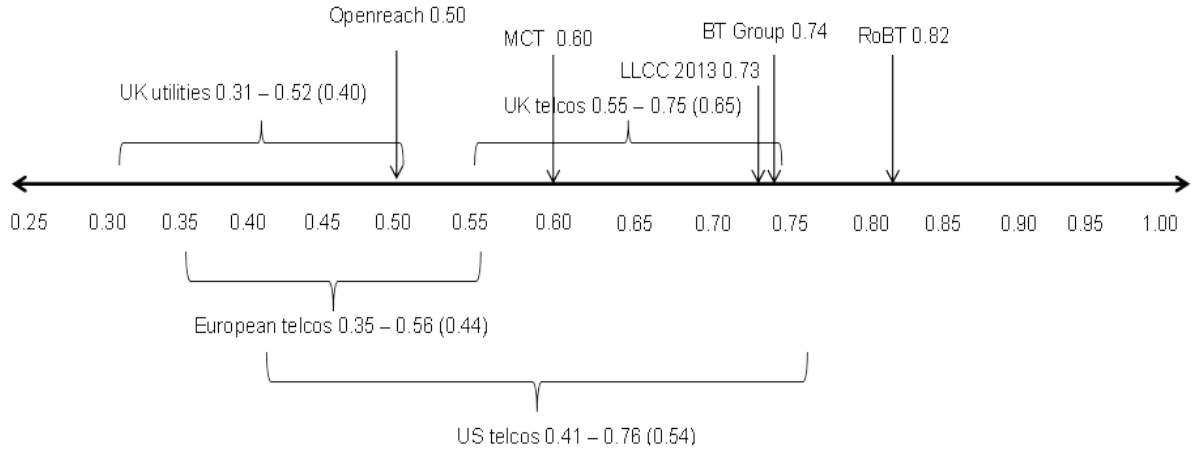
A9.75 We have not been able to identify a pure play comparator for wholesale leased lines so it is difficult to estimate an asset beta specifically for BT's leased lines operations. However, nearly all UK communications providers use leased lines to supply downstream services (e.g. Sky, TalkTalk and Colt) and many overseas communications providers will provide leased lines on a similar wholesale basis as BT, and like BT will typically be part of large, vertically integrated, operations selling a range of telecommunications and bundled services (e.g. Deutsche Telekom, KPN and Orange).

A9.76 Therefore, it is reasonable to consider the asset beta of other telecoms companies, particularly the UK telecoms companies that buy leased lines and overseas telecoms companies that are likely to sell leased lines on a wholesale basis.

A9.77 From Table A9.12 it can be seen that even the maximum asset beta for telecoms comparator companies (around 0.75) lies well below the asset beta derived from the current methodology for RoBT (i.e. 0.82), with the average asset beta for comparators (in the range 0.44 to 0.65) well below that of the RoBT asset beta. This information is illustrated on an asset beta risk spectrum in Figure A9.5 below.

[345] This is consistent with the evidence BT presented to the Competition Commission as part of CWW's appeal of the 2009 LLCC.

Figure A9.5. Asset beta risk spectrum



Source: Asset betas calculated by NERA (UK Utilities,[346] UK Telcos,[347] European Telcos,[348] US Telcos[349]) and Ofcom (Openreach, MCT, RoBT asset betas). 2 year asset betas against the home index assuming a debt beta of 0.1. Averages in brackets.

A9.78 While we consider that it would be difficult to estimate an asset beta specific to leased lines (given the lack of a pure play comparator), the evidence above provides us with the asset betas for companies providing or buying leased lines alongside other wholesale and retail voice, broadband and bundled services to residential and business customers. Therefore, we could estimate an asset beta for BT's 'Other UK telecoms' services which would include wholesale leased lines services as well as its fixed voice, broadband and bundled services. We consider that it would be reasonable to assume that the systematic risk faced by these services is likely to be reasonably similar since they are characterised by: (a) using a fixed telecoms network, which often involves shared or similar infrastructure, and hence similar degrees of operational gearing; and (b) involves sales to customers or consumers who are able to scale demand in response to changes in the macro-economic cycle to a greater extent than for basic copper access lines.

A9.79 Evidence from BT's volume data presented in Table A9.14 and A9.15 above indicates that fixed telecoms usage products provided by BT (which would be included in BT's Other UK telecoms services) have reasonably similar volume fluctuations and levels of forecast accuracy, in particular: leased lines, ISDN, WBA and fixed call minutes. While the volume data for fibre broadband shows more significant variation, we consider that this could reflect the nascent nature of fibre broadband products.

A9.80 We consider that an asset beta for BT's Other UK telecoms services would therefore lie somewhat above the Openreach copper access beta of 0.50 and somewhat below the existing RoBT asset beta of 0.82. Taking account of comparator company asset betas, we propose that a reasonable range today would be between 0.55 and 0.75. This lower bound would be slightly higher than

[346] UK Utilities (6): National Grid, Severn Trent, Pennon Group, United Utilities, Centrica and SSE. Index = FTSE All Share
[347] UK Telcos (3): TalkTalk, BskyB and Colt. Index = FTSE All Share
[348] European Telcos (12): Telefonica SA, Deutsche Telecom, Belgacom SA, KPN, Orange SP, Telecom Italia SPA, Portugal Telecoms, Iliad SA; Mobistar SA, Telenor ASA, Tele2 AB and Swisscom AG. Index = FTSE Europe
[349] US Telcos (5): AT&T, Verizon, Time Warner Cable, Comcast and Century Link. Index = S&P500.

Openreach copper access, yet consistent with the lowest asset beta of UK fixed telecoms comparators and overlap with the top-end of the European telecoms comparator range. The upper bound would be around the upper-end of UK and US telecoms comparators.

Evidence on the asset betas for ICT companies

A9.81 In its 2005 report PwC considered five pure play ICT comparators for BT's Global Services ICT operations. These were CapGemini, HIQ International, Unisys, Getronics and Logica.[350] Getronics was acquired by KPN in 2007 and is now part of the Aurelius Group while Logica was acquired by CGI in 2012. While CGI is predominantly an ICT service company, the Aurelius Group is a holding company with investments across multiple industries and as such does not appear to be a reliable ICT comparator.[351] We have therefore not included Aurelius Group in the list of comparator companies. Table A9.16 presents the 2-year asset betas against the home market index for CapGemini, HIQ, Unisys and CGI.

Table A9.16: Asset betas for ICT comparators

	Asset beta v home index
CapGemini	0.79
HIQ	0.53
Unisys	1.21
CGI	0.64
Min	0.53
Max	1.21
Average	0.79

Source: CEPA. Table shows 2 year asset betas as at 24 April 2015. Home index is FTSE All Europe for CapGemini and HIQ; S&P500 for Unisys and CGI.

A9.82 The asset beta for these ICT companies ranges from 0.53 to 1.21 and averages 0.79 which is above the average asset betas for UK, European and US telecoms companies (where the averages were, respectively, 0 65; 0.44; and 0.54). This is consistent with our a priori expectation that asset betas for ICT companies would be above those for providers of more standard telecoms connectivity and usage services.[352]

Asset beta weightings

A9.83 We continue to prefer an approach in which the asset betas for the constituent parts of BT sum (on a weighted average basis) to our estimate of BT Group's asset beta.

A9.84 We have financial data on much of BT's different lines of business, either from its annual reports or its RFS. This allows us to weight the different parts of BT's

[350] 2005 PwC Report, Table 1, page 15.
[351] The Aurelius Group website says its investments include companies in the following segments: industrial enterprises, chemicals, business services, consumer goods, food & beverage, telecoms, media & technology. http://aureliusinvest.com/en/companies/.
[352] We also cross-checked this result against a broader sample of 23 European and US companies providing 'IT Services' as classified by Bloomberg's BICS industrial classification (we filtered for companies based in Europe or North America with revenues greater than $1bn and over 50% of revenues from IT Services). The 2-year asset betas against the home index for these 23 IT Services companies ranged from 0.34 to 1.21 and averaged 0.80; an average consistent with the updated comparators shown in table A9.16 above.

business, although the metrics available to do this need to be interpreted with some caution. In weighting the different parts of BT's business we are concerned with the economic value of the assets. In practice, this is not easily estimated and we need to rely on proxies, but this can introduce complications associated with, for example, using accounting book values (which depend on accounting policies and how the replacement cost of assets is treated) and the valuation of intangible assets (which could represent a greater source of economic value in the unregulated parts of BT).

A9.85 As set out above, we have estimated the weighting to apply to Openreach copper access by considering ratios for MCE, EBITDA and NRC/EV and propose a weighting of 25%, placing more emphasis on the weightings based on EBITDA and NRC/EV and less on the weighting based on MCE.

A9.86 Of the three weighting measures we have considered, only EBITDA is available for the five divisions of BT (Openreach, Wholesale, Business, Consumer and Global Services) using information from BT's annual report. MCE is only reported by BT in its RFS, where around 75% of the MCE is associated with regulated markets.[353] Even if MCE were available in detail for the unregulated parts of BT, this measure is likely to underestimate the economic value of the other parts of BT since it will typically exclude intangible assets. Similarly, the NRC/EV ratio is only available where we have a regulatory cost model, which is limited to certain regulated markets such as fixed access and business connectivity.

A9.87 Table A9.17 shows the proportion of total EBITDA represented by each of BT's divisions over the last two years. Note that the Openreach division reported in the table includes wholesale copper access, wholesale Ethernet leased lines and wholesale fibre broadband access.

Table A9.17: Proportion of total EBITDA represented by each BT division

	2013	2014	Average
Global Services	14%	15%	14%
Openreach	43%	43%	43%
BT Consumer	16%	14%	15%
BT Business	17%	18%	17%
BT wholesale	10%	10%	10%
Other	1%	1%	1%
Total	100%	100%	100%

Source: BT's 2014 annual report. The average column is calculated from the underlying data rather than the rounded values from the 2013 and 2014 columns.

[353] Page 23 of BT's 2013/14 RFS shows £12,672m of MCE for regulated markets out of a total MCE of £16,795m.

A9.88 Given the weighting of 25% that we propose for Openreach copper access, Table A9.17 could be used to derive weightings for Other UK telecoms and the RoBT. The resulting weightings are reported in Table A9.18 below (focusing on the average weightings over the last 2 years from Table A9.17).

Table A9.18: Proportion of total EBITDA represented by Openreach copper access, Other UK telecoms services and RoBT

	Weighting
Openreach copper access	25%
Other UK telecoms services	60%
Rest of BT	15%
Total	100%

Source: Ofcom. Other UK telecoms services is made up of non-copper access parts of Openreach (i.e. wholesale Ethernet leased lines and wholesale fibre access) at 18% (calculated by subtracting 25% for Openreach copper access from total Openreach of 43% from Table A9.17); BT Consumer 15%, BT Business 17% and BT Wholesale 10%. This sums to 60%. Rest of BT is made up of Global Services 14% and "Other" 1%. This sums to 15%.

Would further disaggregation bring about gains for consumers?

A9.89 A further disaggregation of BT Group's asset beta between Other UK telecoms services and the RoBT would mean applying a lower asset beta to leased lines services compared to our existing approach and therefore a lower WACC. In the short run, a lower regulated return would lead to lower prices which would benefit customers and ultimately consumers.[354]

A9.90 On the other hand, the long run benefit to consumers could be damaged if the regulated returns are below the appropriate cost of capital, since this will weaken incentives to invest.

A9.91 However, where it appears unlikely that the systematic risk of the business (in this case leased lines) is higher than that inherent in an appropriate group of comparator companies, our approach to disaggregation should avoid over compensating the firm for investments in the business of interest – i.e. result in an asset beta higher than the group of comparator companies.

A9.92 In this case, applying the RoBT asset beta (estimated under our existing approach) of 0.82 would mean using an asset beta for leased lines which appears particularly high when considering UK, European and US fixed telecoms operators.

Asset beta options

A9.93 In light of the preceding analysis, we now consider the options for a further disaggregation of the BT Group asset beta. We see two main options for estimating an asset beta for use in the LLCC:

1. maintain the status quo – i.e. a two-way split of the BT Group asset beta; or

[354] We regulate wholesale not retail prices, but wholesale prices would be expected to feed through to retail consumers.

2. a three-way split of the BT Group asset beta between: (i) Openreach copper access, (ii) BT's Other UK telecoms services and iii) RoBT, with the leased lines business associated with Other UK telecoms services.

Maintain the status quo

A9.94 As explained above, the existing approach to disaggregating the BT Group asset beta into an Openreach copper access asset beta and a RoBT asset beta gives a RoBT asset beta of 0.82.

A9.95 In light of the market evidence from more recent years, it would not seem appropriate to apply an asset beta of 0.82 to leased lines. However, this does not mean that the existing two-way disaggregation would always be inappropriate. For example, if the current disaggregation approach yielded an asset beta for the RoBT within a credible range based on comparator telecoms companies, then we might be more comfortable retaining the current approach (even though on a priori grounds it is a considerable simplification to group services such as leased lines and standard fixed telecoms services with ICT operations).

Estimate a separate asset beta for Other UK telecoms services provided by BT

A9.96 In theory, it would be most appropriate to identify a separate asset beta for the leased lines business. In practice, the absence of a pure play wholesale leased lines operator makes this difficult. However, the systematic risk in the leased lines business is likely to lie above that of the Openreach copper access business, lie below that of BT's Global Services activities and seems likely to share similar risk characteristics to other fixed broadband, voice and bundled services. The creation of a third disaggregated line of business, which we propose calling 'Other UK telecoms', would overlap to a large extent with many of the services supplied by companies used as comparators to BT.

A9.97 Using these fixed telecoms comparators, as set out in paragraph A9.99, we propose that a reasonable range based on today's evidence would be between 0.55 to 0.75.

A9.98 In choosing a value from within this range, it is important that the asset beta chosen for Other UK telecoms should yield a reasonable estimate of the asset beta for the RoBT, when coupled with the previously determined Openreach copper access asset beta; the statistically estimated BT Group asset beta; and the weights identified for each of the three lines of business.

A9.99 As explained earlier, we propose to apply a weighting of 25% to the Openreach copper access business; 60% to Other UK telecoms; and 15% to the RoBT. Given these weights, Table A9.19 derives the implied RoBT asset beta which follows from values for the Other UK telecoms asset beta in the range 0.55 to 0.75.[355]

Table A9.19: RoBT asset beta for different values for the UK telecoms asset beta

UK telecoms asset beta	Openreach copper access	RoBT
0.55	0.50	1.90
0.65	0.50	1.50
0.75	0.50	1.10

Source: Ofcom. Calculation: RoBT asset beta =[BT Group asset beta - (Openreach asset beta x 25%) + (UK telecoms asset beta x 60%)]/15%

A9.100 The RoBT asset beta largely represents the systematic risk associated with BT Global Services' ICT division. Therefore the suitable comparator set for the RoBT is likely to be ICT companies, particularly those specialising in sales to large corporates and integrating communications with general ICT across many sites and overseas. In paragraphs A9.101 we set out that the asset beta for ICT comparators ranged from 0.53 to 1.21 with an average of 0.79.

A9.101 In order to satisfy the above constraint we consider it appropriate to select a value for the asset beta for Other UK telecoms at the upper end of the range (0.55 to 0.75) so that we deliver a reasonable asset beta estimate for the RoBT. An asset beta value for Other UK telecoms services of 0.75 gives a RoBT asset beta of 1.10.

Proposal on asset beta to apply to leased lines

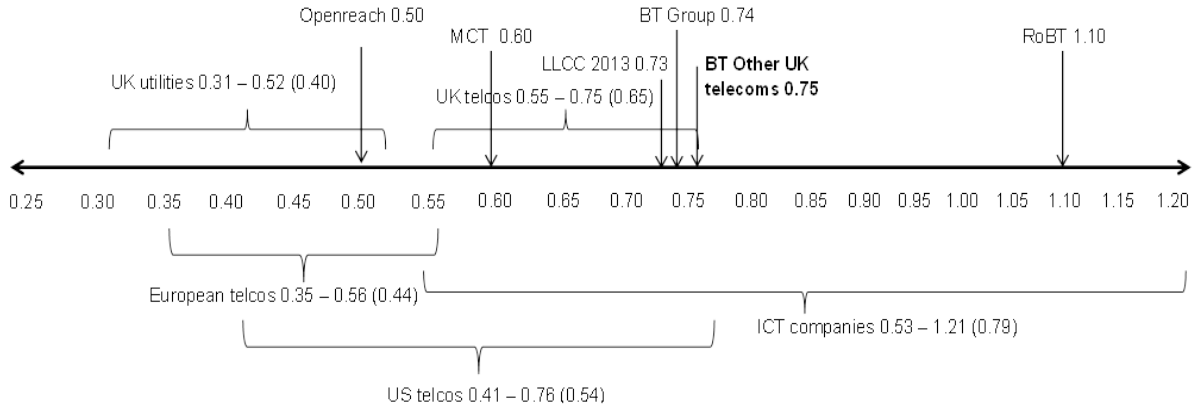
A9.102 Given the current evidence on comparator telecoms operators we do not consider that it would be appropriate to apply an asset beta of 0.82 (derived from our existing two-way disaggregation) to leased lines. We propose to apply an asset beta of 0.75

[355] Given the difficulty in estimating a precise value for the asset beta we prefer to consider estimates in increments of 0.05.

to leased lines services, derived from a three-way disaggregation of the BT Group asset beta, in which the asset beta applied to leased lines would be consistent with that used for a broader category of services which we have described as "Other UK telecoms". We would also envisage applying this "Other UK telecoms" asset beta to other regulated services as appropriate.

A9.103 Our asset beta proposal is shown in Figure A9.7 alongside other benchmark asset betas.

Figure A9.7: Asset beta risk spectrum



Source: Asset betas calculated by NERA (UK Utilities,[356] UK Telcos,[357] European Telcos,[358] US Telcos[359]) and Ofcom (Openreach, MCT, RoBT, BT Other UK telecoms asset betas). 2 year asset betas against the home index assuming a debt beta of 0.1. Averages in brackets.

Proposal on equity beta to apply to leased lines

[356] UK Utilities (6): National Grid, Severn Trent, Pennon Group, United Utilities, Centrica and SSE. Index = FTSE All Share
[357] UK Telcos (3): TalkTalk, BskyB and Colt. Index = FTSE All Share
[358] European Telcos (12): Telefonica SA, Deutsche Telecom, Belgacom SA, KPN, Orange SP, Telecom Italia SPA, Portugal Telecoms, Iliad SA; Mobistar SA, Telenor ASA, Tele2 AB and Swisscom AG. Index = FTSE Europe
[359] US Telcos (5): AT&T, Verizon, Time Warner Cable, Comcast and Century Link. Index = S&P500.

A9.104 In order to estimate the equity beta we require an estimate of the forward-looking gearing appropriate for this part of the business. As set out in paragraphs A9.34, we consider a reasonable forward looking estimate of BT Group's gearing is 30% and that this needs to be appropriate for each part of BT since we have not in the past estimated separate gearing levels for different parts of BT.

A9.105 We consider that a gearing level of 30% would be appropriate to apply to BT's Other UK telecoms services (including leased lines) because the asset beta we are proposing for Other UK telecoms services (0.75) is close to the BT Group average (0.74), indicating that the Other UK telecoms operations could support a similar level of gearing to BT Group overall. We note that the WACC is not particularly sensitive to the gearing assumption. For BT's Other UK telecoms services the pre-tax nominal WACC is 10.1% for all gearing assumptions between 21% and 40%, assuming other WACC parameters remain unchanged.

A9.106 Combining our asset beta estimate of 0.75, our forward looking gearing estimate of 30% and our debt beta assumption of 0.10, we derive a forward looking equity beta of 1.03, which we use to estimate the cost of equity for BT's leased lines business.

Disaggregation of BT Group debt premium

A9.107 As noted earlier in this annex, consistent with previous charge control statements, we consider that a firm facing lower systematic risk could attract a better credit rating for a given level of gearing than a firm facing higher systematic risk. This means that the firm facing lower systematic risk could borrow at lower interest rates.

A9.108 Above we propose to use a debt premium for BT Group of 1.2%, the mid-point of the range 1% to 1.4%.

A9.109 In previous charge controls, when disaggregating the BT WACC between Openreach copper access and the RoBT, we applied the lower bound of the debt premium range for BT Group to Openreach copper access and the upper bound of the range to RoBT.

A9.110 We consider that it remains appropriate to apply the lower bound of the debt premium range, 1%, to Openreach copper access and the higher bound, 1.4%, to the RoBT.

A9.111 Given the further level of disaggregation now proposed, the question is what debt premium to apply to the Other UK telecoms part of BT. Given that we consider the systematic risk associated with the Other UK telecoms part of BT to be between Openreach copper access and the RoBT, we propose to apply the mid-point of the debt premium range, i.e. 1.2%, to Other UK telecoms.

A9.112 This is the same debt premium that we have applied to BT Group. We consider that this is consistent with our view that the systematic risk associated with BT's Other UK telecoms activities (where we have proposed an asset beta of 0.75) is similar to that currently associated with BT Group (with an estimated asset beta of 0.74.

Provisional conclusion

A9.113 Table A9.20 summarises the resulting pre-tax nominal WACC for BT Group and the three-way disaggregation now proposed, i.e. (i) Openreach copper access, (ii) Other UK telecoms and (iii) RoBT. We propose that the WACC for the services

defined as “Other UK telecoms” would be appropriate for the leased lines charge control over the period to 2018/19.

Table A9.20: BT WACC estimates, June 2015

WACC component	BT Group	Openreach copper	Other UK telecoms (including leased lines)	RoBT
WACC (pre-tax nominal)	10.0%	8.4%	10.1%	12.5%

Source: Ofcom

Annex 10

Nera, Estimation of BT's Equity and Asset beta

Introduction

A10.1 Please see the separate document published alongside this consultation entitled Nera, *Estimation of BT's Equity and Asset beta; Report for the Office of* Communications, 19 May 2015. This is available here: http://stakeholders.ofcom.org.uk/binaries/consultations/llcc-dark-fibre/annexes/NERA_final_report.pdf

Annex 11

Adjusting modelled values of X

Introduction

A11.1 In the 2013 LLCC we adjusted our initial estimates of X for both the TI and Ethernet baskets by reallocating £39 million of costs from TI services to the Ethernet basket. This reallocation reduced the charge control for TI from RPI+8.25% to RPI+2.25% and increased the charge control for Ethernet from RPI-13.75% to RPI-11.50%. We made this adjustment on the basis that TI services would attract a declining allocation of common costs as TI service volumes declined and Ethernet volumes increased.[360]

A11.2 As we set out in Annex 8, we continue to forecast demand for low bandwidth TI services to decline significantly over the 2016 control period, while demand for Ethernet services is expected to grow significantly. In this Annex we therefore consider whether or not we should depart from the values of X generated from our typical modelling approach, as we did in the 2013 LLCC.

Departing from our modelled value of X could improve economic welfare, but is not without risks

A11.3 In setting a charge control we focus on what we consider would be an appropriate pattern of cost recovery. In general, we aim to move market outcomes closer to those that we would observe in a competitive market, as we would expect charges in a competitive market to typically be consistent with the pursuit of economic efficiency (i.e. all three types).[361] BT has SMP in a number of markets and therefore is unlikely to set charges that are consistent with those observed in a competitive market absent regulatory intervention.

A11.4 However, modelling how BT would set its prices, and therefore recover its costs, in a competitive market would be an extremely complex and time-consuming task and would involve detailed data on many markets which we do not regulate. For this reason, in most charge controls we adopt a top-down approach to setting charges which takes a simpler, more pragmatic approach.

A11.5 As a simplification, the results of our modelling approach may depart from what we might expect to observe happening over a control period in a competitive market. It therefore may not result in an economically optimal set of charges. Consequently, in some cases it may be appropriate to depart from the modelled charges to improve economic efficiency and welfare. For example, departing from the modelled pattern of cost recovery may be desirable where over time it results in more efficient migration signals or investment/competition incentives.

A11.6 However, departing from our typical modelling approach, i.e. by changing the modelled pattern of cost recovery, can give rise to risks to economic efficiency and welfare. For instance, dynamic efficiency is an important aspect of economic efficiency in the telecoms sector, given the level/repeated nature of investment and

[360] Annex 12, March 2013 BCMR Statement.
[361] We explain the three main types of economic efficiency in Section 4.

the importance of innovation. Dynamic efficiency is supported by creating a regulatory environment that fosters investment and market entry. Such an environment is likely to be promoted by ensuring that investors have an opportunity (not a guarantee) that they will be able to recover their efficiently incurred costs. We seek to provide this opportunity through the use of the 'fair bet' concept.[362] Where departures from our typical modelling approach risk undermining the fair bet they are highly likely to be detrimental to economic efficiency.

A11.7 Given the importance of dynamic efficiency improvements for the telecommunications sector, Ofcom typically attaches considerable weight to the principle that BT should have the opportunity to recover its efficiently incurred costs. Therefore, in weighing up the potential benefits and risks associated with departing from the values of X implied by our typical modelling approach, we attach considerable weight to any concerns that any changes to our modelled costs such as, for example, changing common cost allocations, could render those costs unrecoverable.

The treatment of fixed and common costs under our typical modelling approach

A11.8 Under our top-down modelling approach, we start with BT's existing allocation of costs to those services (i.e. BT's CCA FAC data) in the RFS for the base year of the control. Using BT's CCA FAC data as the starting point for considering cost recovery does not guarantee that all of BT's common costs are recoverable, but it does mean that a share of common costs are taken into account when setting regulated charges. A share of the common costs will also be left for BT to recover in unregulated markets.

A11.9 Under our top-down modelling approach, the fixed and common costs that are recovered from the charge control services are assumed to remain constant (save for inflation and efficiency improvements) over the control period, regardless of volume changes. This approach is a simplification of reality. In practice, we might expect firms to adapt their pattern of cost recovery across services over time, particularly during periods where there are significant changes in demand conditions (e.g. where there are large relative volume changes). For example, we might expect firms to reduce the overall level of common cost recovery from services in decline, and to increase the proportion from growing services.

A11.10 BT's Detailed Attribution Methodology (or DAM) describes how BT allocates costs to services in the RFS. Essentially, BT aims to allocate costs in relation to usage. For example, BT calculates its total costs for a cost category e.g. land and buildings and then spreads that costs among the services that use it. Land and buildings costs are spread between the different services housed at BT's exchanges, in accordance with the amount of floor space devoted to each service. Each year, the amount of fixed common costs allocated to a particular service in the RFS may vary depending on the relative usage of that particular cost item. For example, if there was a large growth in LLU lines, then BT's DAM may allocate fewer of the common costs of land and buildings to leased lines and more to LLU.

[362] The fair bet involves ensuring that when we set charges we do so in a manner that covers the expected value of the costs incurred and that the possibilities of under- or over-recovery of those costs are equally likely.

A11.11 In our charge control modelling, we do not seek to forecast the outcome of the RFS.[363] Rather we seek to establish an appropriate pattern of common cost recovery. Our modelling approach assumes that the total amount of fixed and common costs recovered from modelled services in the base year remains the same throughout the control, adjusted only for changes in efficiency and inflation. If applied consistently across markets and time, it can be consistent with the 'fair bet' approach; through a consistent treatment of common costs in the controls, we can ensure that they are taken into account in one or another of the controls, with no bias to under or over recovery of costs.[364]

A11.12 In most circumstances, the changes in the relative usage of services during a control will be modest. However, in the case of very large volume movements, our modelling approach may result in a large divergence from what we may expect in a competitive market and so could give rise to inefficient outcomes. For example, in the case of an extreme volume decline, our modelling approach could mean that the same amount of fixed and common costs that are modelled to be recovered from numerous circuits at the start of a control period could, be modelled to be recovered from a single circuit at the end of the control period; resulting in sharp increases in unit costs. This may not be an accurate reflection of how common costs are recovered in a competitive market, and could give rise to inefficient price signals. Under such circumstances, we may consider whether it is appropriate to adjust our modelling approach.

A11.13 Any such adjustments would need to be undertaken with caution. If we were to alter the assumed recovery of common costs in one control, but not others (which is to some extent unavoidable given the staggered approach to setting charge controls), there is a risk of undermining BT's opportunity to recover its efficiently incurred costs and the fair bet. Therefore, departing from the modelled pattern of common cost recovery can potentially undermine dynamic efficiency. However, if the change to the pattern of cost recovery is limited to only services within the same control, such a risk can be mitigated.

In the 2013 LLCC we judged that a departure from the modelled X was appropriate

A11.14 In the 2013 LLCC, Ofcom judged that the specific circumstances of that control did warrant a departure from basing its values of X for the price caps on the outputs of its typical approach to modelling X.

A11.15 For both the TI and Ethernet baskets we were forecasting very large changes in volumes over the 2013 LLCC control period. TI volumes were forecast to decline sharply, while Ethernet volumes were forecast to grow quickly. As set out above, our typical modelling approach meant that the substantial changes in the relative

[363] In order to forecast the RFS, we would need to forecast the changes in usage of all BT's services, many of which may belong to unregulated markets. This would be an extremely complex and demanding task, carrying a high risk of error.

[364] This fair bet applies between both regulated and unregulated services. If there is a change in relative usage between two regulated services, then one charge control may lead to BT recovering fewer costs than in the outturn accounts, with the other control recovering more costs. However, in aggregate the total and common cost recovery between the two markets should be equal to the outturn accounts. If during the period of a control, relative usage rises in regulated markets relative to unregulated markets, then the charge control may recover fewer costs than in the outturn RFS. Conversely, where relative usage falls in regulated markets relative to unregulated markets, the charge control may recover higher costs than in the outturn RFS. Crucially, these movements should not be biased in either direction, and therefore are consistent with the 'fair bet'.

volumes of TI and Ethernet services did not give rise to changes in the forecast allocation of common costs to the two groups of services over the control period. As a consequence the 2013 model forecast increasing unit costs for TI services and decreasing unit costs for Ethernet services over the control period. The resulting price caps were RPI+8.25% for TI services and RPI-13.75% for Ethernet services.

A11.16 Although we considered that some increases in the charges for TI services were consistent with lost economies of scale in the provision of those services and to provide a signal for migration to other more efficiently provided services, we did not consider sharp price increases as being consistent with protecting TI customers from excessive charges. In these circumstances, we considered a change in the pattern of common cost recovery from TI to AI services to be appropriate, to reflect the relative usage of these services.

A11.17 Ofcom did not however change the pattern of common cost recovery between TI services and other services outside the LLCC. This decision was based on our concern that if we were to change the pattern of cost recovery between TI and other services outside of the LLCC, the affected costs may not be recoverable. Such a change could therefore be inconsistent with allowing BT the opportunity to recover its efficiently incurred costs and the fair bet. This decision was upheld on appeal to the Competition Commission.[365]

We do not consider a departure from our modelled value of X is appropriate in this case

The market and regulatory context for the 2016 control is different to that in 2013

A11.18 In the 2013 LLCC, we considered it appropriate to change the pattern of common cost recovery between TI and AI services. In particular we were concerned that the modelled value of X for the TI basket would result in a sharp increase in charges for TI services, which would not be consistent with protecting TI customers from excessive charges. We therefore increased the proportion of common costs recovered from Ethernet services and reduced it for TI services. By implementing the change in the pattern of common cost recovery between TI and Ethernet services, which were both within the same charge control, we were able to ensure that BT's opportunity to recover its efficiently incurred costs was not undermined by the change in the pattern of common cost recovery.

A11.19 The circumstances surrounding the control on TI charges are significantly different for the 2016 control as compared to the 2013 control. As set out in Section 6 and Section 7, we have proposed the following ranges:

- TI basket X of -6.25% to -14.25%, with a base case of -12.25%; and
- Ethernet basket X of -9.75% to -17.75%, with a base case of -13.75%.

[365] Competition Commission, *References under section 193 of the Communications Act 2003:* (1*) Verizon UK Limited (2) Vodafone Limited v Office of Communication - Determination*, 12 December 2013, Case 1210/3/13. http://www.google.co.uk/url?sa=t&rct=j&q=&esrc=s&frm=1&source=web&cd=2&ved=0CDwQFjABahUKEwif64jSuYfGAhXCXBQKHYjkAJM&url=http%3A%2F%2Fwww.catribunal.org.uk%2Ffiles%2F1210_Verizon_CC_Determination_121213.pdf&ei=UWV5Vd_-K8K5UYjJg5gJ&usg=AFQjCNGgn8U6Z_-oGo3YglPkniexzhrjjA&sig2=VXoSPf66Y8IhlxhojpY-YQ

A11.20 This contrasts to a modelled TI X (before re-allocation) of +8.25% in the LLCC 2013.

A11.21 Therefore, absent any changes to the pattern of common cost recovery, TI charges will decrease under our proposed charge control (as set out in Section 7, this is primarily due to BT's returns at the start of the control period and our efficiency target for TI operating and capital expenditure). Therefore the concerns we had in relation to sharp increases in TI charges in 2013 do not apply in this control.

Maintaining the fair bet is an important consideration

A11.22 As we set out in Section 4:

- we typically attach considerable weight to the principle that BT should have the opportunity to recover its efficiently incurred costs given its importance to promoting dynamic efficiency;
- we therefore place considerable weight on any concerns that changes to our modelled costs could render any of BT's efficiently incurred costs unrecoverable, and therefore undermine the fair bet principle;
- if our typical modelling approach is applied consistently across markets and time it can be consistent with giving BT a fair bet and if we depart from it there is a risk of undermining the fair bet; and
- while the risk to the fair bet can be mitigated where the change in the pattern of cost recovery is limited to only services within the same control,[366] we are not able to mitigate the risks when the change to the pattern of common cost recovery extends beyond the services within the same control.

A11.23 In considering whether to depart from the pattern of common cost recovery assumed within our modelled values of X we therefore draw a distinction between changes to the pattern of recovery between services within the charge control and outside the control. We do not propose to make changes to the pattern of cost recovery between services outside the control due to the risks associated with undermining the fair bet and therefore economic efficiency. This is consistent with the approach we adopted in the 2013 LLCC.

We do not consider there to be material economic benefits from changing the balance of common cost recovery between TI and Ethernet services

A11.24 Changes to the pattern of recovery between services within the charge control can be implemented in a manner that is consistent with maintaining the fair bet. We therefore have considered whether there are economic efficiency benefits associated with implementing such changes. Where such changes may be appropriate in relation to services that are all within the charge control we would often use a broad control basket to enable BT to amend the pattern of recovery over the control period. However, as explained in Section 5, we do not consider a basket that combines BT's TI and Ethernet services is appropriate for this control, in large part as a result of the BT Undertakings.

[366] Because any changes to common cost recovery can be reflected in the charges for other controlled services, resulting in a consistent basis for setting charges.

A11.25 We have considered whether any material economic efficiency benefits would likely arise from any form of change to the pattern of common cost recovery for leased lines services. It seems that the main potential sources of such benefits would be in relation to:

- **more efficient migration signals** – TI services, particularly those based on 64Kbit/s services, are legacy services that are likely to be coming relatively close to the end of their life. Therefore, there may be benefits to society from providing signals to support efficient migration from legacy TI services to alternative services. Prices can be used as a signal for supporting efficient migration. The evidence considered in relation to market definition in the May 2015 BCMR Consultation[367] suggests that TI prices are unlikely to be a material factor when customers consider migrating to other services. Therefore, changing the balance of common cost recovery between TI and Ethernet services is unlikely to materially impact efficient migration; and

- **more efficient investment/competition incentives** – as noted above, TI services are legacy services which are likely to be relatively close to the end of their life. Therefore significant competitive entry or investment is unlikely regardless of any reasonable potential changes in the pattern of common cost recovery for TI services. However, reducing the proportion of common costs recovered from Ethernet services may undermine efficient competitive entry for these rapidly growing services. Furthermore, while unlikely, substantially reducing TI charges below those reductions already proposed through our modelled X could risk BT having to undertake inefficient investments to supply any resulting increase in demand for low bandwidth TI services. Therefore, changing the balance of common cost recovery between TI and Ethernet services is unlikely to materially improve efficient investment and competition incentives; indeed there appear to be greater risks of detrimental than beneficial impacts.

A11.26 Based on the arguments set out above, we do not consider it would be appropriate to change the recovery of common costs from LLCC services in our charge control model.

Provisional conclusion

A11.27 Given the considerations set out above, we do not propose to change the allocation of common costs for LLCC services and adjust the modelled values of X for this charge control.

[367] Section 5 and Annex 10, May 2015 BCMR Consultation

Annex 12

Price rebalancing analysis to inform Ethernet sub-cap proposals

Introduction

A12.1 As discussed in Section 6, we consider it is likely that BT will ultimately need to rebalance its active prices as a result of the proposed dark fibre being available, and so there may be a concern that sub-caps could be unduly restrictive on prices for charge controlled services such that the necessary rebalancing could not occur. Therefore to inform our proposals for sub-caps on charges within the Ethernet basket, we have therefore carried out an indicative analysis of the potential scale of price rebalancing that may be necessary in light of our proposed dark fibre remedy.

A12.2 It is important to note that this analysis is for our sub-cap proposals only. The total amount that BT is able to recover, and so the overall value of X for the Ethernet basket, is unaffected by the potential need for active price rebalancing.[368]

Analytical approach

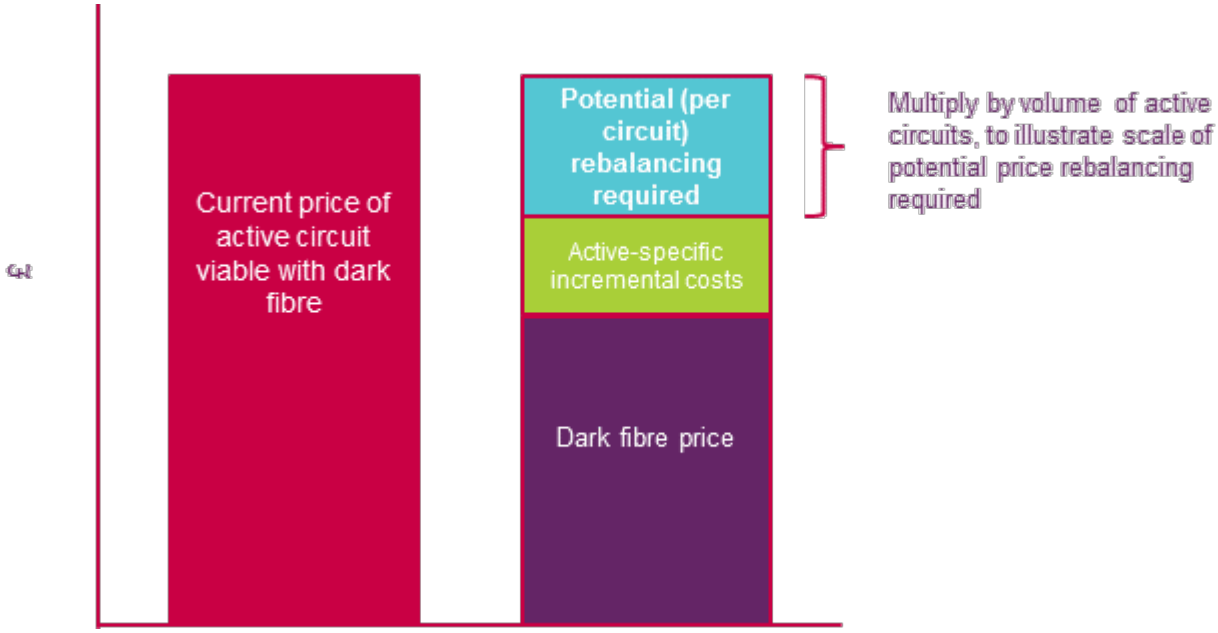
A12.3 In the November 2014 BCMR Passives Consultation, we set out some illustrative examples of the potential price changes that could occur in light the common costs that we identified could be affected were passive remedies to be introduced.[369] However, as we described, there were limitations to this analysis and so in our approach here we have sought to address these to the extent possible, reflecting greater data availability and our more detailed passive remedy proposals, as well as stakeholder responses to the November 2014 BCMR Passives Consultation.

A12.4 Ideally, we would conduct this analysis for 2018/19, as this would allow us to estimate the potential impact on the active pricing structure at the end of the charge control when revenues would have been forecast to come into line with overall costs and volumes are at the level they will be when dark fibre has been introduced. However, inferring 2018/19 prices in the absence of dark fibre (both absolute and the overall pricing structure) would be highly speculative. Therefore we have instead considered the potential scale of active price rebalancing which may be required if the proposed dark fibre remedy was introduced using BT's 2015/16 costs and prices, but 2018/19 volumes so as to reflect the expected future increase in higher bandwidth circuits, in order to provide a snapshot illustration.[370] While we recognise the potential limitations of using 2015/16 cost and price data, we consider that this still provides a reasonable basis for estimating the order of magnitude of this effect in order to inform our view of sub-caps for the purposes of this consultation.

[368] There are two areas where dark fibre may affect the costs forecast in the charge control (namely as a result of cannibalisation of active circuits and dark fibre implementation costs) which we discuss in Section 6 and Annex 6.
[369] Paragraphs 5.10-5.28, November 2014 BCMR Passives Consultation.
[370] We note that BitCommons argued in response to the illustration in the November 2014 BCMR Passives Consultation that the analysis should consider the effect for the most efficient operator (The Bit Commons Limited's non-confidential response to the November 2014 BCMR Passives Consultation, p. 3-4). However, it is not clear what basis we would use for such an analysis, and in any event, given we are considering the impact on BT we consider it appropriate to use BT data.

A12.5 At the extreme, and so as not to understate the scale of rebalancing, we might expect in the longer term that all active circuits which can viably be provided with dark fibre (internal and external) could ultimately end up being priced at a level equal to the dark fibre price plus the active-specific incremental circuit costs, regardless of actual take-up. This is so that BT remains competitive: otherwise, if BT tried to price such circuits above this level, equally efficient CPs could switch to dark fibre and supply the active-specific incremental costs themselves.[371] Given this, we consider that in this scenario, the differential between the active price of circuits which could viably be provided with dark fibre and the price of dark fibre plus the active specific incremental costs could be rebalanced. Therefore we estimate the potential scale of rebalancing by multiplying this differential by the corresponding 2018/19 volumes. This approach is illustrated in Figure A12.1 below.

Figure A12.1: Illustration of our approach to illustrate the potential long term active price rebalancing that may be required for circuits which can viably be provided with dark fibre



Illustrative analysis

A12.6 In light of the approach described above, the first step was to identify which circuits would be most likely to be commercially viable with dark fibre priced on a 1GBit/s active minus basis. Given our proposed pricing approach, we would expect 1Gbit/s EAD and EAD LA circuits to be viable with dark fibre. In addition to this, we identified the active circuit types out of those set out in Table A12.1 below which have a higher price for a one year contract period (i.e. rental plus connection) than the dark fibre price plus the active-specific incremental costs associated with those circuits (based on 2015/16 prices and costs).[372] This is on the basis that a CP which is at least as efficient as BT could purchase dark fibre and supply the active-specific

[371] We recognise that in the short term, existing contractual obligations (with Openreach or downstream customers) for in-contract active circuits may limit the proportion of those active circuits which actually experience such a reduction.

[372] We have selected these services for the purposes of this analysis since they make up the majority of Ethernet circuit types. We have not included EBD (given its different characteristics, as discussed in Annex 8), or Main Link (given it will still be required for dark fibre where it would have been used for the active alternative, and will be priced at the same level).

incremental costs itself for the same (or lower) price than currently charged by BT.[373]

A12.7 From a practical perspective, we have estimated the 2015/16 active-specific incremental costs for each active circuit type (internal and external separately) using the same approach as described in the guidance for calculating the minus for dark fibre pricing. Our inferred 2015/16 dark fibre prices are estimated in line with the proposed guidance described in Section 8 (i.e. 1Gbit/s EAD and EAD LA active minus) using 2015/16 prices and costs, but for the same reasons as described above this is based on external 1Gbit/s EAD and EAD LA prices and costs only. This results in the following circuits being identified as potentially commercially viable.

Table A12.1: Assessment of potential viability of active circuits with dark fibre priced on 1Gbit/s active minus basis, based on one year contract and 2015/16 prices and costs[374]

Active circuit type	Likely to be commercially viable with dark fibre?
EAD 10Mbit/s	No
EAD 100Mbit/s	No
EAD 1Gbit/s	**Yes**
EAD LA 10Mbit/s	No
EAD LA 100Mbit/s	No
EAD LA 1Gbit/s	**Yes**
OSA 10Gbit/s	**Yes**
WES 10Mbit/s	No
WES 100Mbit/s	No
WES 1Gbit/s	No
WES other	No
WES above1Gbit/s	**Yes**
BES 1Gbit/s	No
BES other	No
BES above 1Gbit/s	**Yes**

A12.8 In light of these identified circuits, we estimate the scale of price rebalancing in aggregate that BT may need to implement for its active circuits. This is based on multiplying the active price minus the sum of active-specific incremental costs and the dark fibre price for these circuits by 2018/19 volumes (using the same

[373] We recognise that cost may not be the only factor in the choice between actives and dark fibre, as noted by Six Degrees Group in response to the November 2014 BCMR Passives Consultation (see page 5 of its non-confidential response) who identified customer consistency, support and flexibility as other motivations which may mean CPs elect to take dark fibre even where the costs are marginally higher. However, cost is still likely to be one of the main drivers, and so we abstract from these other considerations at this stage in order to simplify the analysis.

[374] Note, for completeness we have also considered the potential impact of an average active minus approach, which as well as these circuits, EAD LA 10Mbit/s would also appear to be commercially viable (on the same basis as described above).

methodology for the dark fibre prices and active-specific incremental costs as described above). This includes both connections and rentals, and internal plus external volumes, assuming a one for one relationship between active circuits and dark fibre.

A12.9 On this basis, we estimate that approximately £2m could (in aggregate) ultimately need to be rebalanced from higher bandwidth circuits as a result of the proposed dark fibre remedy being introduced on a 1Gbit/s active minus approach.[375] This equates to less than 1% of forecast Ethernet basket revenues in 2018/19 (without the X).[376]

A12.10 While this would be a one-off rebalancing of prices, how exactly it occurs and how it is spread across different circuit types and between rentals and connections would be down to BT, and is likely to depend on a range of factors (including, for example, competitive conditions). As a result, it is highly speculative and unclear at this stage, although we recognise that the impact on individual circuit prices could vary significantly. In addition, we note the timing of the necessary price changes could vary. For example, the price changes could be done as a one-off adjustment, in one year of the charge control, or more gradually. Given existing contracts and potential barriers to migrating existing circuits in this review period as discussed above, BT may not need to adjust all prices immediately.

A12.11 We also note that given the direct link between the dark fibre price and active 1Gbit/s EAD and EAD LA circuit prices, it is possible that BT could seek to rebalance this across the dark fibre price as well as active circuits, meaning the higher bandwidth circuits which could switch to dark fibre may still bear some of this active price rebalancing. As such, the risk of price increases being focused at low bandwidths, and the resulting risk that such increases may create a circularity by driving further substitution of active circuits to dark fibre, may be more manageable.

A12.12 We discuss the implications of this analysis for our view of sub-caps in Section 6.

[375] Note, this effect is considered in aggregate, and so does not illustrate potential rebalancing that could occur between connections and rentals for the same circuit type. [✂].

[376] In comparison, this figure increases to approximately £78m under an average active minus dark fibre pricing approach (or 12% of the forecast Ethernet basket revenues in 2018/19 (without the X)). This illustrates the potential impact of the design of the passive remedy (and in particular, the pricing options) can have on the risk of distributional concerns, as discussed in Annex 24 of the May 2015 BCMR Consultation.

Annex 13

Additional responses to stakeholder submissions

Introduction

A13.1 Ofcom has received a number of submissions from Vodafone relevant to a number of our proposals, particularly our use of glide paths and/or one-off starting charge adjustments for this control period.[377] We have identified the relevant proposals to which they relate and where they can be found in this document in our responses set out below.

Summary of Vodafone's submissions

Frontier Economics' Report

A13.2 In the November 2014 report, Frontier Economics identified the following concerns with Ofcom's typical glide path approach:

- it provides BT with a strong incentive to concentrate **efficiency savings** at the start of a control and to hold back efficiency savings in the middle or end of a control (until the start of the subsequent control), whereas in normal competitive markets it would be expected that efficiency gains would be constant and gradual;
- **information asymmetries** are likely to lead to biased efficiency assumptions and volume forecasts, the impact of which is exacerbated by longer glide paths. Even relatively small divergences in forecast volumes can lead to large differences in the costs that can be recovered from a given charge controlled service;
- even if there is not a bias in volume forecasts, it would be perverse to maintain prices which are not reflective of costs for a period of up to six years. In a competitive market, it is unlikely that prices could take up to six years for excessive margins to be competed away;
- **discontinuities in prices** are observed in competitive markets and so is not a reason to avoid setting prices close to costs;
- the impact of prices not reflecting costs is more likely to lead to inefficient investment decisions by other operators than the presence of discontinuities in prices; and
- unit cost reductions may not reflect efficiency but may instead reflect **reductions in quality**.

[377] Vodafone's Frontier Economics report; Vodafone's CC Baskets; and Vodafone's Error Correction.

A13.3 In light of these concerns, Frontier Economics recommended that Ofcom should:

- consider 'P0' adjustments (i.e. one-off starting charge adjustments) where forecast error has led to prices to be out of line with costs, unless there is clear evidence that there would be strong offsetting inefficiencies;
- consider explicit error correction mechanisms to ensure prices better proxy a competitive outcome. Frontier Economics argues that these mechanisms would aim to minimise the effect of forecast error. It further argues that well-constructed mechanisms should maintain the incentive effects of price caps, but ensure prices do not excessively depart from costs, leading to an outcome which reduces the risks to both BT and customers;
- perform an ex post analysis of charge control outcomes to understand reasons for over or underperformance; and
- impose quality requirements to ensure cost reductions are not driven by reductions in quality of service.

Vodafone's February 2015 submissions

A13.4 In February 2015 Vodafone submitted two papers[378] to Ofcom that set out a suggested approach for implementing a volume forecast error correction mechanism. These papers provide additional detail on a possible implementation of the error correction mechanism Frontier Economics' report raised as a recommendation for Ofcom. Vodafone explained that "*an over-recovery of fixed and common costs arising from conservative volume forecasts would appear to be one of the contributors to the above expected returns obtained by BT from regulated products*".[379]

A13.5 In this paper Vodafone suggests an 'error correction' method that it claims would bring the charge in the third year of any charge control closer to the level that would have been obtained with a perfect volume forecast, by shifting to alternative glide paths during the charge control period should outturn volumes depart from forecast. Vodafone suggests that the tools to enable the 'glide path' shift are already in place. It argues that Ofcom frequently calculates and publishes sensitivity tests as part of its process for setting charge controls. For example, Vodafone notes that in the leased lines charge control consultation in 2012 Ofcom published the values of X that would have arisen from volume forecasts 10% above and 10% below those used in the base case. These sensitivities are argued to give 'off the shelf' alternative glide paths that would have been selected with higher or lower volume forecasts than that used when originally setting the charge control.

A13.6 Vodafone claims that such an approach would entail only a minor increase in the complexity of charge control compliance. Furthermore, Vodafone argues that while "*the arrangement would not eliminate all excess profitability that was earned without merit, it would reduce it significantly and avoid the situation where the forecasts used become more out of step as each month of the charge control passes*".[380]

[378] Vodafone's Error Correction and Vodafone's CC Baskets submission.
[379] Vodafone's Error Correction submission, p. 1.
[380] Vodafone's Error Correction submission, p. 16.

Our response to Frontier Economics' concerns

A13.7 Our responses to the concerns raised in Frontier Economics' report are set out below.

Efficiency savings

A13.8 In our view one of the benefits of using glide paths, rather than one-off starting charge adjustments, is to mitigate the very risks that Frontier Economics identify in relation to glide paths. Although regulation typically seeks to mimic the outcomes of competitive markets, it is unlikely to be a perfect substitute for effective competition. Replicating the same incentives to pursue efficiency savings over time is one such area where regulation may not be a perfect substitute for effective competition.

A13.9 As set out in the May 2015 BCMR Consultation, the markets covered by the leased lines charge control are not effectively competitive, meaning that regulation is required. In assessing the merits of the glide path approach, the appropriate counterfactual is therefore the main regulatory alternative to the use of glide paths; i.e. one-off starting charge adjustments (as advocated by Frontier Economics itself). Under this framework, the incentives to pursue efficiency savings decline over the control period because the regulated firm expects charges to be reset to cost at the start of the next control. In the extreme, the firm has little or no incentive to pursue initiatives that will deliver efficiency improvements at the very end of the control period, as it will not be able to share in any of the benefits of such improvements over the following control period.

A13.10 However, under the glide path approach, the firm would have some incentive to pursue such initiatives, as it would benefit from any improvements during the following control period. While those incentives may not be as strong as those associated with a competitive market, they should be greater under the glide path approach than the one-off adjustment approach. The latter is more akin to a rate of return control[381] which, as we discuss below, has the advantage of achieving better allocative efficiency but at the expense of productive and dynamic efficiency.

Information asymmetries

A13.11 We recognise that there may be information asymmetries between us and BT. These asymmetries, if not mitigated, could give rise to biased efficiency and volume forecasts. However, our approach to setting charge controls seeks to mitigate such risks.

A13.12 First, we use our statutory information gathering powers to request forecast evidence from BT. The use of our formal powers means that BT is required to provide truthful and accurate information. Second, we seek to base those forecasts on a wide base of evidence from a range of stakeholders and other sources (see Annex 8). Third, where we use forecasts from BT to inform our forecasts we use those that BT itself uses for business management purposes, and therefore has less incentive to bias. As we set out in Sections 6 and 7 and Annex 8, there does

[381] Rate of return regulation involves setting prices in line with an operator's efficiently-incurred costs (including an appropriate return on capital) at all times. In general rate of return regulation does not allow the regulated firm to retain the benefits (through additional profits) that are generated from efficiency savings, as the reductions in cost that arise from the efficiency savings will feed straight through (or at least very quickly) into regulated charges.

not appear to be compelling evidence of BT systematically under-forecasting volumes across all markets and services. Rather, the evidence on forecast error suggests that BT has historically under-forecast volumes for some services and over-forecast volumes for others.

A13.13 In relation to efficiency, we also seek to use a broad range of evidence upon which to base our conclusions, including evidence used by BT, and gathered by Ofcom using our formal powers, for its own business management purposes.

A13.14 Even if there was evidence to suggest that our volume and efficiency assumptions were biased, the question is what the appropriate regulatory response is. As set out above, the choice between the use of glide paths and one-off starting charge adjustment, or other mechanisms that depart form the glide path approach, involves a trade-off between different economic efficiencies. Tying prices more closely to outturn costs over time may mitigate the impact on prices of biased forecasts, but it also undermines BT's incentives to pursue efficiency improvements and volume growth. In our judgement, customers of leased lines services are better served through a balance that places greater emphasis on incentives to pursue efficiency improvements and volume growth.

A13.15 We recognise that in extreme cases our typical glide path approach could involve BT benefiting from improvements in efficiency or volume growth that we did not forecast when setting charge controls for up to six years; though we note that, in practice, efficiency savings are passed on over time under a glide path approach so this is an extreme scenario. For the reasons set out above, this regulatory lag is an important element of supporting the incentives for BT to pursue efficiency improvements and volume growth, the benefits of which are ultimately shared with customers. There is a trade-off between the length of the regulatory lag and these incentives.

A13.16 Ofcom's judgement in a number of previous charge controls, including those in relation to business connectivity services, has been that the use of glide paths strikes the appropriate balance. Frontier Economics argues that such a lag is 'perverse' and unlikely to be consistent with what happens in competitive markets. However, it provides no evidence to support its assertions. In our view, we would expect to see considerable differences across competitive markets in terms of the speed with which prices would converge with costs following efficiency improvements by one firm. The speed of adjustment would reflect, amongst other factors, the speed with which firms can profitably replicate the changes made by the first-mover firm to improve its efficiency.

Discontinuities in prices

A13.17 We acknowledge that discontinuities in pricing may occur in competitive markets, for example where new, much cheaper technologies are introduced. However, where such disruptions and discontinuities occur due to the regulatory process they are likely to lead to a less stable and predictable investment environment.

Reductions in quality

A13.18 We recognise that unit cost reductions may not reflect efficiency improvements, but may instead reflect reductions in quality. Although robustly identifying the extent to which historical changes in unit costs can be attributed to changes in quality is difficult.

Our responses to Frontier Economics and Vodafone's recommendations

We propose to retain our general preference for glide paths

A13.19 We propose to retain our general preference for glide paths. As set out in Section 4, there are circumstances where we do consider implementing a starting charge adjustment. In Sections 6 and 7, we explain our proposals for doing so for both the Ethernet and TI baskets respectively. As discussed in Section 4 (and for the reasons set out above), we do not agree that our approach should be one in which there is a presumption that starting charge adjustments will be made unless there is clear evidence of strong offsetting inefficiencies.

We do not consider it appropriate to adopt new error correction mechanisms

A13.20 We do not consider it appropriate to adopt error correction mechanisms. As set out in Section 3, we are proposing to adopt a price cap form of control reflecting the superior incentive properties of price caps as opposed to alternative forms of control. The incentive properties of price caps arise from the ability of the regulated firm to benefit from out-performing the charge control assumptions through increased profitability as incurred costs fall below forecast costs. Under the main alternative form of charge control, rate of return controls, the regulated firm's charges are closely tied to incurred costs over the period of the control. This has the advantage of lowering risks to BT and its customers but it also removes the incentive for BT to deliver additional volumes or efficiency savings, as the benefits of such improvement will be quickly passed onto customers.

A13.21 The use of error correction mechanisms within a price cap has the effect of moving closer to a rate of return control. In the extreme, a rate of return control could be characterised as a price cap with a complete set of adjustment mechanisms.

A13.22 In considering the use of error correction mechanisms, we consider it important to distinguish between factors that are exogenous to the firm, and those that are endogenous. Where it is possible to identify factors that are largely exogenous to the firm, error correction mechanisms could be employed within a price cap without significantly impacting on the firm's incentives to appropriately manage those factors. Furthermore, it may lead to a more appropriate allocation of risks between the firm and its customers. Generalised inflation is typically considered to be exogenous to the firm and hence why inflation-X forms of price cap are widely adopted by regulators in the UK and beyond.

A13.23 By contrast, where factors are to a significant extent endogenous to the firm, it is difficult to construct mechanisms that correct for forecast errors but do not undermine the incentive properties that arise from the ability to out-perform the forecast.

A13.24 In our view, leased lines volumes are in large part endogenous to BT because they are driven by factors such as price and quality, which, under the current regulatory framework, are partly determined by BT. We therefore consider that error correction mechanisms in relation to volumes are unlikely to be appropriate. Vodafone's suggested approach to implementing a volume error correction mechanism does not address the impact on BT's incentives to pursue volume growth as it would remove any benefit BT gains from out-performing the base case volume forecast. In short, Vodafone's proposal does not appear to constitute the "*well-constructed mechanism[s]*" that "*should maintain the incentive effects of price caps*" referred to by Frontier Economics in its November 2014 report.

A13.25 Furthermore, one of the characteristics of leased line markets is that volumes can deviate year-on-year around a long-term trend.[382] Therefore, it could be that volume forecasts over a three year period are reasonably accurate by the end but changes in years one and two of the control are different to what was expected; for example, one year of particularly strong growth is followed by a year of weaker growth. If we imposed a starting charge adjustment based on short-term deviations, this would have implications for the stability and predictability of the regulatory environment. We believe that the risks associated with this are likely to outweigh the potential benefits of adjusting prices based on volume changes, particularly as any variation in cost due to short-term deviations is unlikely to be biased in a particular direction.[383]

We have undertaken an analysis of the outcomes of the March 2013 BCMR Statement charge control

A13.26 We agree that the specific circumstances of the charge control in the March 2013 BCMR Statement imply that there is value in understanding how the current charge control appears to be performing. Our broad conclusions from this exercise, set out in Annex 5, do not appear to suggest that our high-level approach to imposing charge controls on BT's business connectivity services, including the use of glide paths, needs to be fundamentally changed. Rather the primary cause of BT's higher than expected profitability relates to a series of changes in BT's cost allocations, which we have addressed as part of this review.

May 2015 BCMR Consultation is proposing minimum quality standards

A13.27 We recognise that BT's SMP in certain business connectivity markets is likely to give rise to incentives to lower quality of service rather than pursue more difficult efficiency improvements. As explained in paragraph Section 13 of the May 2015 BCMR Consultation, we are therefore proposing a minimum quality of service standard imposed through a SMP condition. However, we also note that degrading BT's incentives to pursue volume growth, through reduced reliance on glide paths or through volume error correction mechanisms, could reduce BT's incentives to improve quality.

[382] This is potentially one of the reasons for the variation in our 2013 LLCC volume forecasts for the year 2013/14 (see Annex 8 for further details).
[383] As explained in Annex 8, when we compare our volume forecasts in the 2013 LLCC with actual out-turns in the first year of the existing control, we observe that some of our forecasts are lower than the out-turns whilst some are higher (and some are broadly in line).

Annex 14

Proposed guidance on assessment of BT's pricing of Dark Fibre Services

Introduction

A14.1 This Annex sets out proposed guidance on how we would anticipate undertaking an assessment of whether BT is complying with draft SMP condition 5C. The proposed guidance should therefore be read alongside draft SMP condition 5C in Annex 15.

A14.2 This proposed guidance reflects the approach we would expect to take based on the information available to us at this time. However, any assessment of BT's compliance with the proposed SMP condition would be based on the prevailing circumstances at the time, and it may therefore be appropriate to depart from this guidance. We would expect to do so only where circumstances are materially different from those described in this guidance. For example, our guidance is based on the existing attribution of costs to components in the RFS; if this attribution changes, our assessment of costs may need to adapt to reflect the new attribution of costs. We would anticipate however, that such changes would be consistent with the principles in this guidance.

A14.3 Defined terms used in this proposed guidance are the same as those used in draft SMP condition 5C unless otherwise stated.

Structure of this guidance

A14.4 In draft SMP condition 5C.1, we propose a basis of charges condition requiring BT to ensure that charges for Dark Fibre Services are set by reference to charges for the reference Ethernet products, namely 1Gbit/s EAD and 1Gbit/s EAD LA, adjusted to reflect the difference in costs. In, particular:

- the dark fibre price should reflect the long-run incremental costs avoided by BT when providing that Dark Fibre Service instead of a corresponding 1Gbit/s EAD or 1Gbit/s EAD LA service; and
- the dark fibre price should reflect the long run incremental costs of any objectively justifiable differences between that Dark Fibre Service and the corresponding 1Gbit/s EAD or 1Gbit/s EAD LA service.

A14.5 This proposed guidance sets out how we would anticipate calculating the LRIC that are avoided by BT for the purposes of draft SMP condition 5C. In particular, we provide guidance in relation to:

- which costs we would expect to BT to avoid in the long-run by providing Dark Fibre instead of the corresponding EAD and EAD LA 1Gbit/s services; and
- differences between the dark fibre Reference Offer (RO) and the benchmark EAD services.

Which costs to include in the differential

A14.6 This sub-section sets out our proposed guidance on which specific costs we would expect to be included in the LRIC that are avoided by BT when providing Dark Fibre Service instead of the corresponding 1Gbit/s EAD service or 1Gbit/s EAD LA service.

A14.7 Based on BT's RFS for 2013/14, we have identified nine super-components used to provide EAD and EAD LA services. We consider that these super-components can be categorised into two groups – asset-based components, mainly associated with equipment and network infrastructure, and service support components, relating to other operating costs required to provide EAD services.

A14.8 Table A14.1 below shows the nine super-components and whether they are classified as asset based or service support components. It also indicates whether the relevant costs are attributed to rentals, connection charges, or both.

Table A14.1: Classification of Ethernet super-components

Super-Component	Asset/Service	Rentals	Connections
Wholesale and LAN extension services fibre	Asset	X	X
Ethernet Main links	Asset	X	
Ethernet Electronics	Asset	X	
Access cards (other services)	Asset	N/A	N/A
Service Centres (Provision)	Service		X
Routeing and Records	Service		X
Service Centres (Assurance)	Service	X	
Sales Product Management	Service	X	X
Revenue Debtors	Service	X	X

Source: BT's 2014 RFS and Ofcom. An 'X' indicates that the cost super-component contributes to the cost of either rental or connection charges.

Asset-based super-components

A14.9 Wholesale and LAN extension services fibre covers costs associated with the provision of local access fibre. We do not consider that these costs are likely to be specific to active services, and we would therefore not expect these costs to be reflected in the LRIC avoided by BT.

A14.10 Ethernet main links covers costs associated with the provision of the Ethernet main link components. We do not consider that these costs are likely to be specific to active services, and we would therefore not expect these costs to be reflected in the LRIC avoided by BT.

A14.11 Access cards (other services) cover costs associated with equipment downstream of EAD. We do not expect the costs for this component to be attributed to EAD services from 2014/15. We do not consider that these costs are likely to be specific to active services, and we would therefore not expect these costs to be reflected in the LRIC avoided by BT.

A14.12 Ethernet Electronics covers costs associated with operating and maintaining active equipment, including the capital costs of that equipment. These costs do not appear to be associated with the passive infrastructure elements. However, we would not expect all of the costs of the Ethernet Electronics super-component to be included in the LRIC avoided by BT, as some of the costs may relate to systems used for multiple services.

A14.13 We would expect an attribution of these costs to be included in the LRIC avoided by BT, based on the proportion of costs that would not be incurred if BT provided Dark Fibre services instead of the corresponding EAD 1Gbit/s or 1Gbit/s EAD LA services. We propose that this proportion of cost should be estimated by the LRIC to FAC ratio for this component using LRIC and FAC data from BT's LRIC model.

Service support super-components

A14.14 The Service Centres (Provision) super-component covers the costs of staff working in Openreach customer contact centres who deal with enquiries and complaints related to provisioning processes. We do not consider that these costs are specific to active services, and we would therefore not expect these costs to be reflected in the LRIC avoided by BT.

A14.15 The Routeing and Records super-component covers the costs associated with the physical verification and initial recording of routings within the network. We do not consider that these costs are specific to active services, and we would therefore not expect these costs to be reflected in the LRIC avoided by BT.

A14.16 The Service Centres (Assurance) super-component covers the costs of staff working in Openreach customer contact centres who deal with enquiries and complaints relating to fault reporting and repairs. We propose that a proportion of these costs should be included in the LRIC avoided by BT. We propose that the proportion of Service Centre (Assurance) costs that are incremental to active services should be estimated on the basis of the reduction of fault volumes for the provision of dark fibre services instead of the reference Ethernet services..

A14.17 The Sales Product management super-component covers the costs of staff who work in the Sales Product Management division of Openreach. For Sales Product Management, we consider that a share of these costs should be reflected in the LRIC avoided by BT, based on an allocation between active and passive activities in proportion to the share of active incremental costs (excluding this component) relative to the overall EAD cost stack.

A14.18 The Revenue Debtors super-component covers part of the working capital for a service. Revenue Debtor costs are an estimate of the debts owed for each service based on BT's standard payment terms and assuming that the service is sold

externally. For Revenue Debtors, we consider that a share of these costs should be reflected in the LRIC avoided by BT, based on an allocation between active and passive activities in proportion to the share of active incremental costs (excluding this component) relative to the overall EAD cost stack.

BT's non-domestic rates

A14.19 We consider that an appropriate attribution of BT's non-domestic rates bill should also be reflected in the LRIC avoided by BT. This attribution should be based on the proportion of BT's Cumulo rates costs that are avoided as a result of the active leased line circuits that are replaced by Dark Fibre Services. Based on the current information we have, we anticipate that this would be based on the attribution of BT's Cumulo rating costs to EAD 1Gbit/s services.

Differences between the dark fibre RO and the benchmark EAD services

A14.20 Our draft SMP condition 5C.1 allows for the potential that BT's dark fibre service may differ from EAD services in some respects.

A14.21 Our draft SMP condition 5C.1 requires that the dark fibre price should reflect the long run incremental costs of any objectively justifiable differences between that Dark Fibre Service and the corresponding 1Gbit/s EAD or 1Gbit/s EAD LA service. We would therefore expect differences in incremental cost arising from any such differences between the services to be reflected in BT's charges.

A14.22 We expect BT to specify arrangements for these processes in its reference offer. We expect any charges for these services to be based on the long-run incremental costs of any differences between the active and passive product. That is, to the extent that there is a corresponding charge for the 1Gbit/s EAD or 1Gbit/s EAD LA active service, we would expect that the corresponding charge for the dark fibre equivalent, would be based on that charge, minus any long-run incremental costs avoided by not providing the active service.

A14.23 Migration activities related to dark fibre services may differ from those involved with the provision of active services. We expect that BT should set the charge for migration to reflect the long-run incremental costs of any objectively justifiable differences associated with migrating to dark fibre products rather than to active products.

Annex 15

Draft legal instruments

Introduction

A15.1 This will be separately published in conjunction with the June 2015 LLCC Consultation.

Annex 16

Sources of evidence

Introduction

A16.1 We have noted throughout this Consultation the evidence we have relied upon in relation to our proposals and how we have relied upon that evidence. This Annex lists the main sources of evidence used. We also list all respondents to our consultations and to our formal information requests.

A16.2 Whilst the Annex lists the main evidence we have relied upon, the list is for convenience only and is not intended to be exhaustive.

List of respondents to the call for inputs

A16.3 We published a Call for Inputs (CFI) on 1 April 2014 (the April 2014 BCMR CFI) setting out our proposed approach to this market review and seeking stakeholder input. This can be found at the following link: http://stakeholders.ofcom.org.uk/consultations/business-connectivity-market-review/

A16.4 The closing date for responses was 27 May 2014 and the following stakeholders responded in writing: BT; Cinven Partners LLP; City of London Corporation; Colt; Grange Hotels; KCOM; MBNL; SSE plc; Sky; TalkTalk; The Bit Commons; UKCTA; Verizon; Virgin Media; Vodafone; and one other CP who requested anonymity.

A16.5 We have published the non-confidential versions of the responses from all the stakeholders listed above. These can be found on our website: http://stakeholders.ofcom.org.uk/consultations/business-connectivity-market-review/?showResponses=true

A16.6 We published the November 2014 Passives Consultation on 5 November 2014. Responses were due on 5 January 2015. We have published the non-confidential versions of the responses from all the stakeholders on our website: http://stakeholders.ofcom.org.uk/consultations/bcmr-passives/?showResponses=true

Information-gathering using statutory powers (s135)

A16.7 During this market review, we have issued a series of notices under section 135 of the Act requiring BT to provide specified information as set out in the notice. The provision data was necessary to inform our cost modelling and analysis of the efficiency of BT's business connectivity market services. These information requests are listed below:

- Information request addressed to BT dated 7 August 2014 (**1st s135 notice**).
- Information request addressed to BT dated 3 October 2014 (**2nd s135 notice**).
- Information request addressed to BT dated 21 October 2014 (**3rd s135 notice**).
- Information request addressed to BT dated 6 November 2014 (**4th s135 notice**).

- Information request addressed to BT dated 20 November 2014 (**5th s135 notice**).
- Information request addressed to BT dated 21 November 2014 (**6th s135 notice**).
- Information request addressed to BT dated 1 December 2014 (**7th s135 notice**).
- Information request addressed to BT dated 12 January 2015 (**8th s135 notice**).
- Information request addressed to BT dated 2 February 2015 (**9th s135 notice**).
- Information request addressed to BT dated 5 February 2015 (**10th s135 notice**).
- Information request addressed to BT dated 13 February 2015 (**11th s135 notice**).
- Information request addressed to BT dated 27 February 2015 (**12th s135 notice**).
- Information request addressed to BT dated 26 February 2015 (**13th s135 notice**).
- Information request addressed to BT dated 9 March 2015 (**14th s135 notice**).
- Information request addressed to BT dated 18 March 2015 (**15th s135 notice**).
- Information request addressed to BT dated 20 March 2015 (**16th s135 notice**).
- Information request addressed to BT dated 27 March 2015 (**17th s135 notice**).
- Information request addressed to BT dated 27 April 2015 (**18th s135 notice**).
- Information request addressed to BT dated 11 May 2015 (**19th s135 notice**).

A16.8 During this market review, we have issued a series of notices under section 135 of the Act requiring OCPs to provide specified information as set out in the notice. The provision data was necessary to inform how we expect volumes of leased lines services to change in the next 5 years. These information requests are listed below:

- Information request addressed to Colt dated 1 December 2014
- Information request addressed to EE dated 12 December 2014
- Information request addressed to Hutchinson 3G UK Limited dated 16 December 2014
- Information request addressed to Mobile Broadband Network Limited dated 12 December 2014
- Information request addressed to Sky dated 12 December 2014
- Information request addressed to TalkTalk dated 2 December 2014
- Information request addressed to Telefonica O2 Limited dated 17 December 2014
- Information request addressed to Verizon dated 1 December 2014

- Information request addressed to Virgin Media dated 2 December 2014
- Information request addressed to Vodafone dated 4 December 2014

A16.9 During this market review, we have issued a series of informal information requests to OCPs. The provision data was necessary understand the likely take-up of any potential passive remedies, and the volume impact on active services. These information requests are listed below:

- Information request addressed to Colt dated 11 February 2015
- Information request addressed to EE dated 28 January 2015
- Information request addressed to Mobile Broadband Network Limited dated 28 January 2015
- Information request addressed to Sky dated 26 January 2015
- Information request addressed to TalkTalk dated 5 February 2015
- Information request addressed to Telefonica O2 dated 26 January 2015
- Information request addressed to Verizon dated 26 January 2015
- Information request addressed to Virgin Media dated 27 January 2015
- Information request addressed to Vodafone dated 26 January 2015

A16.10 During this market review, we have issued a series of informal information requests to OCPs. The provision data was necessary determine the treatment of term discounts with the charge control. These information requests are listed below:

- Information request addressed to EntaGroup dated 16 February 2015
- Information request addressed to Exponential-e dated 16 February 2015
- Information request addressed to KCOM dated 16 February 2015
- Information request addressed to Level3 dated 16 February 2015
- Information request addressed to Sky dated 16 February 2015
- Information request addressed to SSE dated 16 February 2015
- Information request addressed to TalkTalk dated 16 February 2015
- Information request addressed to Verizon dated 16 February 2015
- Information request addressed to Virgin Media dated 16 February 2015
- Information request addressed to Vodafone dated 13 February 2015

UK Legislation

A16.11 The Competition Act 1998, www.legislation.gov.uk/ukpga/1998/41/contents

A16.12 The Enterprise Act 2002, www.legislation.gov.uk/ukpga/2002/40/contents

A16.13 The Communications Act 2003 www.legislation.gov.uk/ukpga/2003/21/contents

A16.14 The Central Rating List (England) Regulations 2005 http://www.legislation.gov.uk/uksi/2005/551/contents/made

A16.15 The Central Rating List (Amendment) (England) Regulations 2006 (SI 2006/495) http://www.legislation.gov.uk/uksi/2006/495/resources

A16.16 The Central Rating List (Amendment) (England) Regulations 2008 (SI 2008/429) http://www.legislation.gov.uk/wsi/2008/2672/contents/made

A16.17 The Central Rating Lists (Wales) Regulations 2005 (SI 2005/422) http://www.legislation.gov.uk/wsi/2005/422/body/made

A16.18 The Non-Domestic Rating (Chargeable Amounts) (England) Regulation 2009 http://www.legislation.gov.uk/uksi/2009/3343/pdfs/uksi_20093343_en.pdf

Ofcom documents

A16.19 Ofcom, *Business Connectivity Market Review, Review of competition in the provision of leased lines, Consultation",* 15 May 2015, http://stakeholders.ofcom.org.uk/binaries/consultations/bcmr-2015/summary/BCMR_Sections.pdf (**May 2015 BCMR Consultation**).

A16.20 Ofcom, *Business Connectivity Market Review, Timetable and initial call for inputs, Consultation*, 1 April 2014, http://stakeholders.ofcom.org.uk/consultations/business-connectivity-market-review/ (**April 2014 BCMR CFI**).

A16.21 Ofcom, *Business Connectivity Market Review, Review of retail leased lines, wholesale symmetric broadband origination and wholesale trunk segments, Statement*, 28 March 2013, http://stakeholders.ofcom.org.uk/consultations/business-connectivity-mr/?a=0 (**March 2013 BCMR Statement**).

A16.22 Ofcom, *Cost Attribution Review* (to be published shortly), (**June 2015 Cost Attribution Review**).

A16.23 Ofcom, *Excess Construction Charges for Openreach Ethernet Access Direct, Directions affecting the operation of the Leased Lines Charge Control, Statement*, 16 May 2014, http://stakeholders.ofcom.org.uk/binaries/consultations/excess-construction-charges/statement/excess-construction-charges-statement.pdf (**May 2014 ECC Direction**).

A16.24 Ofcom, *Ofcom Consultation Guidelines November 2007*, http://stakeholders.ofcom.org.uk/consultations/how-will-ofcom-consult Ofcom

A16.25 Oftel, *Access to Bandwidth: Delivering Competition for the Information Age – Statement*, November

1999,http://www.ofcom.org.uk/static/archive/oftel/publications/1999/consumer/a2b1199.htm

A16.26 Ofcom, *Fixed access market reviews: wholesale local access, wholesale fixed analogue exchange lines, ISDN and ISDN30: LLU and WLR Charge Controls – Statement*, 26 June 2014 (**June 2014 FAMR Statement**):

- Volume 1: http://stakeholders.ofcom.org.uk/binaries/telecoms/ga/fixed-access-market-reviews-2014/statement-june-2014/volume1.pdf
- Volume 2: http://stakeholders.ofcom.org.uk/binaries/telecoms/ga/fixed-access-market-reviews-2014/statement-june-2014/volume2.pdf

A16.27 Ofcom, *Fixed access market reviews: Approach to setting LLU and WLR charge controls*, *Consultation*, 11 July 2013, http://stakeholders.ofcom.org.uk/binaries/consultations/llu-wlr-cc-13/summary/LLU_WLR_CC_2014.pdf (**July 2013 FAMR CC Consultation**).

A16.28 Ofcom, *Review of the wholesale broadband access markets: Statement on market definition, market power determinations and remedies*, 26 June 2014, http://stakeholders.ofcom.org.uk/binaries/consultations/review-wba-markets/statement/WBA-Statement.pdf (**June 2014 WBA Statement**).

A16.29 Ofcom, *Leased Lines Charge Control: A new charge control framework for wholesale traditional interface and alternative interface products and services*, 2 July 2009, http://stakeholders.ofcom.org.uk/binaries/consultations/llcc/statement/llccstatement.pdf (**July 2009 LLCC Statement**).

A16.30 Ofcom, *Partial Private Circuits Charge Control: Final Statement*, 30 September 2004 http://stakeholders.ofcom.org.uk/binaries/consultations/ppc_charge_control/statement/ppc_stmnt.pdf (**September 2004 LLCC Statement**).

A16.31 Ofcom, *Wholesale ISDN130 price control, Statement*, 12 April 2012, http://stakeholders.ofcom.org.uk/binaries/consultations/isdn30-price-control/statement/ISDN30_final_statement.pdf (**April 2012 ISDN30 Statement**).

A16.32 Ofcom, *Disputes between each of Sky, TalkTalk, Virgin Media, Cable & Wireless and Verizon and BT regarding BT's charges for Ethernet services, Determinations and Explanatory Statement*, 20 December 2012, http://stakeholders.ofcom.org.uk/binaries/consultations/ethernet-services/annexes/Ethernet_FD.pdf (**December 2012 Ethernet Disputes Determinations**).

A16.33 Ofcom, *Regulatory Financial Reporting – Final Statement*, 20 May 2014, http://stakeholders.ofcom.org.uk/binaries/consultations/bt-transparency/statement/financial-reporting-statement-may14.pdf (**May 2014 Regulatory Reporting Statement**).

A16.34 Ofcom, *Mobile Call Termination market review 2015-2018. Statement on the markets, market power determinations and the remedies – Statement*, 17 March 2015, http://stakeholders.ofcom.org.uk/binaries/consultations/mobile-call-termination-14/statement/MCT_final_statement.pdf (**March 2015 MCT Statement**).

A16.35 Ofcom, *Ofcom's approach to risk in the assessment of the cost of capital, Statement*, 18 August 2005, http://stakeholders.ofcom.org.uk/binaries/consultations/cost_capital2/statement/final.pdf (**August 2005 WACC Statement**).

A16.36 Ofcom, *Business Connectivity Market Review, Preliminary consultation on passive remedies*, 5 November 2014, http://stakeholders.ofcom.org.uk/binaries/consultations/bcmr-passives/summary/BCMR_passives.pdf (**November 2014 BCMR Passives Consultation**).

A16.37 Ofcom, *Local loop unbundling: setting the fully unbundled rental charge ceiling and minor amendment to SMP conditions FA6 and FB6 - Statement*, 30 November 2005, http://stakeholders.ofcom.org.uk/binaries/consultations/llu/statement/llu_statement.pdf (**November 2005 LLU Statement**).

A16.38 Ofcom, *Leased Lines Charge Control: Proposals for a new charge control framework for certain leased lines services*, 5 July 2012, http://stakeholders.ofcom.org.uk/binaries/consultations/llcc-2012/summary/LLCC_2012.pdf (**July 2012 LLCC Consultation**);

A16.39 Ofcom, *Fixed access market reviews: Approach to setting LLU and WLR charge controls*, 20 August 2013, http://stakeholders.ofcom.org.uk/binaries/consultations/llu-wlr-cc-13/summary/LLU_WLR_CC_2014.pdf (**August 2013 LLU/WLR Consultation**).

A16.40 Ofcom, *Business Connectivity Market Review. Very low bandwidth leased lines – Consultation*, 15 May 2015, http://stakeholders.ofcom.org.uk/consultations/very-low-bandwidth/ (**May 2015 Very Low Bandwidth Services Consultation**).

A16.41 Ofcom, *LLCC PPC Points of Handover pricing review. Final Statement on modification of SMP Conditions - Statement*, 21 September 2011, http://stakeholders.ofcom.org.uk/consultations/revision-points-handover-pricing/final-statement/ (**September 2011 POH Statement**).

A16.42 Ofcom, *WBA Charge Control, Charge control framework for WBA Market 1 services, Statement*, 20 July 2011, http://stakeholders.ofcom.org.uk/binaries/consultations/823069/statement/statement.pdf (**July 2011 WBA Charge Control Statement**).

A16.43 Ofcom, *Review of BT's Network Charge Control, Explanatory Statement and Notification of decisions on charge controls in wholesale narrowband markets*, 15 September 2009, http://stakeholders.ofcom.org.uk/binaries/consultations/review_bt_ncc/statement/nccstatement.pdf

A16.44 Ofcom, *Review of the fixed narrowband services markets, Statement on the proposed markets, market power determinations and remedies*, 26 September 2013, http://stakeholders.ofcom.org.uk/binaries/consultations/nmr-2013/statement/Final_Statement.pdf (**September 2013 Narrowband Statement**).

A16.45 Ofcom, *Better policy-making: Ofcom's approach to impact assessment*, http://stakeholders.ofcom.org.uk/binaries/consultations/ia_guidelines/summary/condoc.pdf

A16.46 Ofcom, *Directions for Regulatory Financial Reporting, Statement*, 30 March 2015, http://stakeholders.ofcom.org.uk/binaries/consultations/financial-reporting/statement/statement.pdf (**March 2015 Directions Statement**).

A16.47 Ofcom, *Review of the wholesale local access market. Identification and analysis of markets, determination of market power and setting of SMP conditions - Explanatory statement and notification*, 16 December 2004, http://stakeholders.ofcom.org.uk/binaries/consultations/rwlam/statement/rwlam161204.pdf (**December 2004 WLA Statement**).

A16.48 Ofcom, *Valuing copper access, final statement*, 18 August 2005, http://stakeholders.ofcom.org.uk/binaries/consultations/copper/statement/statement.pdf (**August 2005 Valuing Copper Access Statement**).

A16.49 Ofcom, A new pricing framework for Openreach – Annexes, Statement, 22 May 2009, http://stakeholders.ofcom.org.uk/binaries/consultations/openreachframework/statement/annexes.pdf

EC documents

A16.50 EC, *Directive 2002/21/EC of the European Parliament and of the Council of 7 March 2002 on a common regulatory framework for electronic communications networks and services*, 24 April 2002 OJ L108/33, as amended by Directive 2009/140/EC and Regulation 544/2009, http://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:32002L0021 (**Framework Directive**).

A16.51 EC, *Commission recommendation of 29 March 2005 on the provision of leased lines in the European Union – Part 2 – pricing aspects of wholesale leased lines part circuits*, 1 April 2005, OJ L83/52, http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32005H0268, and the accompanying explanatory memorandum (the **Leased Lines Pricing Recommendation**).

A16.52 EC, *Commission recommendation of 11.9.2013 on consistent non-discrimination obligations and costing methodologies to promote competition and enhance the broadband investment environment*, 11 September 2013 C(2013) 5761, https://ec.europa.eu/digital-agenda/en/news/commission-recommendation-consistent-non-discrimination-obligations-and-costing-methodologies

Ofcom/Third party research

A16.53 BDRC, *A report for Ofcom by BDRC*, http://stakeholders.ofcom.org.uk/binaries/consultations/bcmr-2015/annexes/BCMR_2014_report-bdrc.pdf (**BDRC Survey**).

A16.54 Nera Economic Consulting, *Estimation of BT's Equity and Asset beta, for the Office of Communications (Ofcom)*, 19 May 2015, http://stakeholders.ofcom.org.uk/binaries/consultations/llcc-dark-fibre/annexes/NERA_final_report.pdf (**Nera Report**).

A16.55 PwC, Disaggregating BT's Beta: A report prepared for Ofcom by PricewaterhouseCoopers LLP, June 2005, http://stakeholders.ofcom.org.uk/binaries/consultations/cost_capital2/annexes/disaggregating.pdf (2005 PwC report).

A16.56 Legg Mason, 2014 *Legg Mason Global Investment Survey*, 2014, http://www.leggmason.com/globalthoughtleadership/410390-LGEN016205¬2014-GIS-Summary-Brochure-A4-v4d.pdf

A16.57 Garbacz, C and Thompson, H, Universal telecommunication service: A World perspective, 20 April 2005, http://teams/sites/kc/elib/topic/Economics/Universal%20Telecommunications%20Service%20A%20World%20Perspective%20Garbacz%202005.pdf

A16.58 Intven, H, Olivier, J and Sepulveda, E, Telecommunications Regulation Handbook, http://www.itu.int/ITU-D/treg/Documentation/Infodev_handbook/7_Appendix.pdf

Other documents

Bank of England

A16.59 Bank of England, *Conditioning assumptions, MPC key judgments, and indicative projections*, February 2015 http://www.bankofengland.co.uk/publications/Documents/inflationreport/2015/febca.pdf (**Bank of England Inflation Report**).

BEREC

A16.60 BEREC, *Revised BEREC common position on best practice in remedies imposed as a consequence of a position of significant market power in the relevant markets for wholesale leased lines*, 26 November 2012, BoR (12) 126, http://berec.europa.eu/eng/document_register/subject_matter/berec/regulatory_best_practices/common_approaches_positions/1096-revised-berec-common-position-on-best-practices-in-remedies-as-a-consequence-of-a-smp-position-in-the-relevant-markets-for-wholesale-leased-lines (**BEREC Common Position**).

A16.61 ERG, *Revised ERG common position on the approach to appropriate remedies in the ECNS regulatory framework*, May 2006, ERG(06)33 http://www.google.co.uk/url?sa=t&rct=j&q=&esrc=s&frm=1&source=web&cd=3&cad=rja&uact=8&ved=0CC4QFjAC&url=http%3A%2F%2Fpfs.is%2Fupload%2Ffiles%2Ferg_06_33_remedies_common_position_june_06.pdf&ei=xj5sVbS0KYSrgwSymoGACQ&usg=AFQjCNEUFKQ8Qiif2lM-Nl7Z499e5n3ExA&sig2=wnVVHsSMDHsXP6tulZepng&bvm=bv.94455598,d.eXY (**ERG Revised Common Position**).

BT

A16.62 BT, *Regulatory Financial Statements* (RFS), http://www.btplc.com/Thegroup/RegulatoryandPublicaffairs/Financialstatements/index.htm

A16.63 BT, *Contents of charge control baskets*, 12 December 2014, http://stakeholders.ofcom.org.uk/binaries/telecoms/market-reviews/LLCC/bt.pdf.

A16.64 BT, *Undertakings given to Ofcom by BT pursuant to the Enterprise Act 2002,* 19 June 2014, http://stakeholders.ofcom.org.uk/binaries/telecoms/policy/bt/Consolidated_Undertakings24.pdf

A16.65 BT Group, *Detailed Attribution Methods*, 15 August 2014, http://www.btplc.com/Thegroup/RegulatoryandPublicaffairs/Financialstatements/2014/DAM2014.pdf (DAM)

A16.66 BT, *Report requested by Ofcom describing certain changes to the Accounting Documents for the year ended 31 March 2013 and illustrating the resulting differences to the Current Cost Financial Statements had those changes not applied*, 3 October 2013, http://www.btplc.com/Thegroup/RegulatoryandPublicaffairs/Financialstatements/2013/ReportrequestedbyOfcomfortheyearended31March2013.pdf (**2013/14 BT Report requested by Ofcom**)

A16.67 BT, *Report requested by Ofcom describing certain changes to the Accounting Documents for the year ended 31 March 2014 and illustrating the resulting differences to the Current Cost Financial Statements had those changes not applied*, 2 October 2014, http://www.btplc.com/Thegroup/RegulatoryandPublicaffairs/Financialstatements/2014/ReportrequestedbyOfcomfortheyearended31March2014.pdf (**2014/15 BT Report requested by Ofcom**).

A16.68 BT, *Change Control Notification in accordance with SMP Condition 21 of Ofcom's Regulatory Financial Reporting Final Statement published on 20 May 2014*, 31 March 2015, http://www.btplc.com/Thegroup/RegulatoryandPublicaffairs/Financialstatements/2015/ChangeControlNotification-31March2015.pdf (**March 2015 Methodology Review**).

A16.69 BT, *Current cost financial statements 2014 including Openreach Undertakings, Statement by Ofcom*, http://www.btplc.com/Thegroup/RegulatoryandPublicaffairs/Financialstatements/2014/Current_Cost_Financial_Statement_2014.pdf

A16.70 BT, 2014 Annual Report, http://www.btplc.com/Sharesandperformance/Annualreportandreview/pdf/2014_BT_Annual_Report_smart.pdf

A16.71 BT, 2015 Annual Report, https://www.btplc.com/Sharesandperformance/Annualreportandreview/pdf/2015_BT_Annual_Report.pdf

A16.72 BT, *Press release on its quarter 4 2013/14 and annual 2013/14 results*, 8 May 2014, https://www.btplc.com/News/ResultsPDF/q414-release.pdf (**Q4 press release**).

A16.73 BT, *Pay Review 2015,* http://www.prospect.org.uk/select_an_industry/telecoms/employers/bt/payreview/index?_ts=1

A16.74 BT, *Financial review: profit on sale of property fixed assets,* 2002, http://www.btplc.com/report/financial_fixedassets.shtml

A16.75 BT, *Long Run Incremental Cost Model: relationships and parameters*, 15 August 2014, http://www.btplc.com/Thegroup/RegulatoryandPublicaffairs/Financialstatements/2014/LRICModelRelationshipsandParameters2014.pdf (**BT's LRIC Model**).

A16.76 BT, *Ethernet private networks*, http://business.bt.com/networking/ethernet/?msgtype=23&s_cid=btb_ppc_maxus_google_g_ethernet_managed_-_broad_managed_core_-_broad_broad_+managed_+ethernet&gclid=CjwKEAjw-ZqrBRDt_KjhjcbzhhISJAAlRGvlTj10mLOz6eUf2CLFV5zevIPloRhCyoDhyqcHH57cSBoCljnw_wcB&dclid=CMn6pOm55MUCFa5jwgodCMsAiQ

A16.77 BT presentation, *LLCC 2016 Basket Design Discussions*, 3 November 2014.

A16.78 BT presentation, *Term Discounts and the AI/MI basket(s)*, 5 February 2015.

A16.79 BT presentation, *Elasticities for Accommodation: TI Markets (including Point of Handover and Wholesale Regional Trunk Segments)*, sent to Ofcom on 2 December 2014.

A16.80 BT presentation, *Leased Lines Charge Control: Elasticities for Accommodation in TI Markets*, 23 January 2015.

A16.81 BT presentation, *AT Kearney, Global Competitive Benchmarking (GCB) 2013*, Meeting with Ofcom, 17 October 2014.

A16.82 BT, *Cost Transformation Teach-in*, 9 December 2014, https://www.btplc.com/Sharesandperformance/Presentations/downloads/CTteach-in_9Dec2014.pdf

A16.83 BT Wholesale presentation to Ofcom, *Leased Lines Charge Control Ofcom Meeting – TI issues*, 22 January 2015 (**BT Wholesale's TI issues presentation**).

A16.84 BT, Price List, NetStream, Section 57 Subpart 3, http://www.bt.com/pricing/current/Netstream_1_and_16_boo/3475_d0e2927.htm#3475-d0e2927

A16.85 BT Wholesale, Radio Base Station Backhaul, https://www.btwholesale.com/pages/static/products-services/radio-base-station-backhaul.htm as at 27 May 2015.

A16.86 BT Wholesale, Carrier Price List, https://www.btwholesale.com/pages/static/help-and-support/pricing/carrier-price-lists.htm as at 27 May 2015.

A16.87 Openreach, Fact sheet: Withdrawal of WES, WEES and BES, http://www.openreach.co.uk/orpg/home/products/ethernetservices/wholesaleextensionservices/wes/downloads/WES_BES_WEES_withdrawal_fact_sheet.pdf

A16.88 Openreach, WES/WEES – EAD migration offer, https://www.openreach.co.uk/orpg/home/products/ethernetservices/legacymigrations/specialmigrationconnectionoffer/specialmigrationconnectionoffer.do

A16.89 Openreach, *Price List, Access Locate and Access Locate Plus*, https://www.openreach.co.uk/orpg/home/products/pricing/loadProductPriceDetails.do?data=q%2B2vpfgQQ99SiimXeC7QjskLe4HVN3IVHU%2BmY7RLKoBZ6rNZujnCs99NbIKJZPD9hXYmiijxH6wrCQm97GZMyQ%3D%3D (Access Locate Price List)

A16.90 Openreach, *Price List, Cablelink*, https://www.openreach.co.uk/orpg/home/products/pricing/loadProductPriceDetails.do?data=kgnGm8XSPQZEY5UMJxGwO9yDfzzeTWgW5o%2FPQLWLvfwlMnGHsqd

C0vzO163bJmh34D91D7M0q8u%2F%0AIlSgtIFAKw%3D%3D (Cablelink Price List).

A16.91 Openreach, Price List, Excess Construction Charges, http://www.openreach.co.uk/orpg/home/products/pricing/loadProductPriceDetails.do?data=pAWshrQ7XRSLb9S%2BW8IAk0G8vUtdrlJTUevDC2QqJZ8lMnGHsqdC0vzO163bJmh34D91D7M0q8u%2FIlSgtIFAKw%3D%3D (ECC Price List).

A16.92 Openreach, Price List, Bulk Transport Link, https://www.openreach.co.uk/orpg/home/products/pricing/loadProductPriceDetails.do?data=F6GFzqfhDSmh7Oyv8Xw%2BtziW%2FvYZGtoQraq%2BNu4alFhZ6rNZujnCs99NbIKJZPD9hXYmiijxH6wrCQm97GZMyQ%3D%3D as at 28 May 2015.

A16.93 Openreach, *Price List, Ethernet Access Direct (EAD) including EAD Enable*, https://www.openreach.co.uk/orpg/home/products/pricing/loadProductPriceDetails.do?data=5uW5cDedIGJkun%2FLo2I67PEgpNm%2BtShF6YESRcCqrDFZ6rNZujnCs99NbIKJZPD9hXYmiijxH6wrCQm97GZMyQ%3D%3D as at 28 May 2015.

A16.94 Openreach, Price List, Wholesale Extension Service & Wholesale End to end Extension Service, https://www.openreach.co.uk/orpg/home/products/pricing/loadProductPriceDetails.do?data=TG6A8jbarofqqfNi%2BYxJT%2BWX9RC8ygO7YK%2FGFXHQ0KYlMnGHsqdC0vzO163bJmh34D91D7M0q8u%2FIlSgtIFAKw%3D%3D as at 28 May 2015.

A16.95 Openreach, Price List, Backhaul Network Services (BNS), https://www.openreach.co.uk/orpg/home/products/pricing/loadProductPriceDetails.do?data=to6u3F12FmH4GL92i3NosYRiskel2ZrKBXGHf8sPBYwlMnGHsqdC0vzO163bJmh34D91D7M0q8u%2FIlSgtIFAKw%3D%3D as at 28 May 2015.

A16.96 Openreach, Price List, Openreach Network Backhaul Services, https://www.openreach.co.uk/orpg/home/products/pricing/loadProductPriceDetails.do?data=Rdc2f4wj9k%2FpIcoq3gDRrhrww6STLWGzW%2FOBqqNvfIllMnGHsqdC0vzO163bJmh34D91D7M0q8u%2FIlSgtIFAKw%3D%3D as at 28 May 2015.

A16.97 Openreach, Price List, Backhaul Extension Service (BES), https://www.openreach.co.uk/orpg/home/products/pricing/loadProductPriceDetails.do?data=Gb5DlOwDeWrdvLSdpeomsa0DzFBxAUIONmfpe3%2FG3G4lMnGHsqdC0vzO163bJmh34D91D7M0q8u%2FIlSgtIFAKw%3D%3D as at 28 May 2015.

A16.98 Openreach, Price List, Wholesale Extension Service & Wholesale End to end Extension Service, https://www.openreach.co.uk/orpg/home/products/pricing/loadProductPriceDetails.do?data=TG6A8jbarofqqfNi%2BYxJT%2BWX9RC8ygO7YK%2FGFXHQ0KYlMnGHsqdC0vzO163bJmh34D91D7M0q8u%2FIlSgtIFAKw%3D%3D as at 28 May 2015.

A16.99 Openreach, Price List, Backhaul Network Services (BNS), https://www.openreach.co.uk/orpg/home/products/pricing/loadProductPriceDetails.do?data=to6u3F12FmH4GL92i3NosYRiskel2ZrKBXGHf8sPBYwlMnGHsqdC0vzO163bJmh34D91D7M0q8u%2FIlSgtIFAKw%3D%3D as at 28 May 2015.

A16.100 Openreach, Price List, Openreach Network Backhaul Services, https://www.openreach.co.uk/orpg/home/products/pricing/loadProductPriceDetails.do?data=Rdc2f4wj9k%2FpIcoq3gDRrhrww6STLWGzW%2FOBqqNvfIllMnGHsqdC0vzO163bJmh34D91D7M0q8u%2FIlSgtIFAKw%3D%3D as at 28 May 2015.

A16.101 Openreach, Price List, Ethernet Backhaul Direct, https://www.openreach.co.uk/orpg/home/products/pricing/loadProductPriceDetails.do?data=F6GFzqfhDSmh7Oyv8Xw%2Bt6ZkEknUEHFW9O1w%2FCiItaVZ6rNZujnCs99NbIKJZPD9hXYmiijxH6wrCQm97GZMyQ%3D%3D as at 28 May 2015.

A16.102 Openreach, Price List, Backhaul Extension Service (BES), https://www.openreach.co.uk/orpg/home/products/pricing/loadProductPriceDetails.do?data=Gb5DlOwDeWrdvLSdpeomsa0DzFBxAUIONmfpe3%2FG3G4lMnGHsqdC0vzO163bJmh34D91D7M0q8u%2FIlSgtIFAKw%3D%3D as at 28 May 2015.

A16.103 Openreach, Price List, Ethernet Access Direct (EAD) including EAD Enable, https://www.openreach.co.uk/orpg/home/products/pricing/loadProductPriceDetails.do?data=5uW5cDedIGJkun%2FLo2I67PEgpNm%2BtShF6YESRcCqrDFZ6rNZujnCs99NbIKJZPD9hXYmiijxH6wrCQm97GZMyQ%3D%3D as at 28 May 2015.

A16.104 Openreach, Price List, Optical Spectrum Access, https://www.openreach.co.uk/orpg/home/products/pricing/loadProductPriceDetails.do?data=Wk%2B2hSVL2knF5F0Ve%2F1N8yiJl4DeIvXU8bqZRwL0sgJZ6rNZujnCs99NbIKJZPD9hXYmiijxH6wrCQm97GZMyQ%3D%3D as at 28 May 2015.

A16.105 Openreach, Price List, Optical Spectrum Extended Access, https://www.openreach.co.uk/orpg/home/products/pricing/loadProductPriceDetails.do?data=Wk%2B2hSVL2knF5F0Ve%2F1N8%2BzJs9AuBR97ln%2B8uxoSog9Z6rNZujnCs99NbIKJZPD9hXYmiijxH6wrCQm97GZMyQ%3D%3D as at 28 May 2015.

Competition Commission

A16.106 Competition Commission, *Northern Ireland Electricity Limited price determination*, *A reference under Article 15 of the Electricity (Northern Ireland) Order 1992,* 26 March 2014, https://assets.digital.cabinet-office.gov.uk/media/535a5768ed915d0fdb000003/NIE_Final_determination.pdf (**2014 NIE Final Determination**).

A16.107 Competition Commission, *References under section 193 of the Communications Act 2003: The Carphone Warehouse Group plc v Office of Communications, Case 1111/3/3/09 – Determination*, 31 August 2010, http://www.catribunal.org.uk/files/1.1111_Carphone_Warehouse_CC_Determination_310810.pdf

A16.108 *Competition Commission report: Stansted Airport Ltd - Q5 price control review*, 'Appendix L: Cost of Capital', 23 October 2008, http://www.caa.co.uk/docs/5/ergdocs/ccstanstedl.pdf

A16.109 *Competition Commission, Cable & Wireless UK v Office of Communications. Case 1112/3/3/09 - Determination*, 30 June 2010, http://www.competition-commission.org.uk/assets/competitioncommission/docs/pdf/non-inquiry/appeals/communications_act/final_determination_excised_version_for_publication

A16.110 Competition Commission, *References under section 193 of the Communications Act 2003: (1) Verizon UK Limited (2) Vodafone Limited v Office of Communication - Determination*, 12 December 2013, Case 1210/3/13. http://www.google.co.uk/url?sa=t&rct=j&q=&esrc=s&frm=1&source=web&cd=2&ved=0CDwQFjABahUKEwif64jSuYfGAhXCXBQKHYjkAJM&url=http%3A%2F%2Fwww.catribunal.org.uk%2Ffiles%2F1210_Verizon_CC_Determination_121213.pdf&ei=U

WV5Vd_-K8K5UYjJg5gJ&usg=AFQjCNGgn8U6Z_-oGo3YglPkniexzhrjjA&sig2=VXoSPf66Y8IhlxhojpY-YQ

DECC

A16.111 DECC, *Updated Energy & Emissions Projections*, September 2014, https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/399175/Annex_M__corrected_23-Dec-2014_.xls

HM Treasury

A16.112 HM Treasury, Forecasts for the UK economy, May 2015, https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/428467/Forecasts_for_UK_economy_May_2015.pdf

Monopolies and Mergers Commission

A16.113 Monopolies and Mergers Commission (MMC), *Telephone Number Portability: A report on a reference under s13 of the Telecommunications Act 1984,* (MMC, 1995).

Office of National Statistics

A16.114 ONS, *Annual Survey of Hours and Earnings, 2014 Provisional Results, Office of National Statistics,* 19 November 2014, http://www.ons.gov.uk/ons/dcp171778_385428.pdf

A16.115 ONS, *Labour Market Statistics – integrated FR – average weekly earnings – total pay, Data series KAB9*, 13 May 2015, http://www.ons.gov.uk/ons/datasets-and-tables/data-selector.html?cdid=KAB9&dataset=lms&table-id=15

TalkTalk

A16.116 A report for TalkTalk prepared by Alix Partners, *BCMR Call for Inputs: Common Cost Recovery*, June 2014, http://stakeholders.ofcom.org.uk/binaries/telecoms/market-reviews/LLCC/BCMR_Call_for_Inputs_Common_Cost_Recovery_A_report_for_TalkTalk_by_Alix_Partners,_June_2014.pdf

A16.117 TalkTalk, *Intergroup common costs*, October 2014, http://stakeholders.ofcom.org.uk/binaries/telecoms/market-reviews/LLCC/TalkTalk.pdf

A16.118 TalkTalk, *Allocating IGCCs*, December 2014, http://stakeholders.ofcom.org.uk/binaries/telecoms/market-reviews/LLCC/Allocating_IGCCs_TalkTalk_December_2014.pdf

A16.119 TalkTalk, *Letter from Andrew Heaney, TalkTalk to David Brown and Marina Gibbs, Ofcom*, June 2014 http://stakeholders.ofcom.org.uk/binaries/telecoms/market-reviews/LLCC/Letter_TalkTalk_Ofcom.pdf

Vodafone

A16.120 Frontier Economics report for Vodafone, *The relationship between BT profitability and price regulation*, November 2014,

http://stakeholders.ofcom.org.uk/binaries/telecoms/market-reviews/LLCC/The_Relationship_Between_BT_Profitability_and_Charge_Controls_A_report_for_Vodafone_by_Frontier_Economics_November_2014.pdf (**Vodafone's Frontier Economics report)**.

A16.121 Vodafone, *Quality of Service assumptions in BCMR 2016 charge controls, February 2015*, http://stakeholders.ofcom.org.uk/binaries/telecoms/market-reviews/LLCC/qos-Vodafone.pdf (**Vodafone's QoS submission**).

A16.122 Vodafone, *Consequences of Charge Control Baskets*, February 2015, http://stakeholders.ofcom.org.uk/binaries/telecoms/market-reviews/LLCC/Consequences_of_charge_control_baskets_Vodafone_February_2015.pdf (**Vodafone's CC Baskets**).

A16.123 Vodafone, *Suggested approach to charge control volume forecast error correction*, November 2014, http://stakeholders.ofcom.org.uk/binaries/telecoms/market-reviews/LLCC/Suggested_approach_to_charge_control_volume_forecast_errror_correction_Vodafone_February_2015.pdf (**Vodafone's Error Correction**).

Valuation Office Agency

A16.124 Valuation Office Agency (VOA), *VOA rating manual, volume 5*, http://manuals.voa.gov.uk/corporate/Publications/Manuals/RatingManual/RatingManualVolume5/toc.html

A16.125 VOA, *Business rates*, https://www.gov.uk/introduction-to-business-rates

Annex 17

Glossary

21st Century Network (21CN)	BT's next generation network upgrade.
2013 LLCC	The current leased line charge controls.
2013 LLCC Model	The model published in conjunction with the March 2013 BCMR Statement.
2015 LLCC Base Year Model	The base year model used for the preparation of the June 2015 LLCC Consultation.
2015 LLCC Model	The model published in conjunction with the June 2015 LLCC Consultation.
2016 LLCC	The charge controls that we propose to implement in the 2016 BCMR Statement for the leased line markets effective from 1 April 2016 until 31 March 2019
2016 BCMR Statement	The statement that will be published implementing charge controls for the leased line markets effective from 1 April 2016 until 31 March 2019. See Annex 15 for links to this document.
Accumulated (HCA) depreciation	Totality of deductions made to the original purchase price of a tangible fixed asset to reflect its cumulative consumption since acquisition.
Accumulated (CCA) depreciation	Totality of deductions made to the gross replacement cost of a tangible fixed asset to reflect its cumulative consumption since acquisition.
Alternative Interface (AI)	Leased line services typically using an Ethernet interface.
Alternative interface symmetric broadband origination (AISBO)	Leased line terminating segment typically using an Ethernet interface.
Anchor pricing	An approach that sets the upper bound for charges of existing services by reference to the cost of providing those services using existing technology. This ensures that the introduction of new technology which is intended to provide a greater range of services does not inappropriately lead to an increase in the cost of the existing services.
Asset Volume Elasticity (AVE)	The percentage increase in capital costs required for a 1% increase in volume.

Backhaul	Connections between access nodes and core nodes.
Backhaul Ethernet Services (BES)	A BT wholesale Ethernet service providing high bandwidth inter-exchange connectivity.
Bandwidth	In digital telecommunications systems, the rate measured in bits per second (bit/s), at which information can be transferred.
Bulk Transport Link (BTL)	A BT wholesale Ethernet interconnection product providing high bandwidth, point-to-point connections between an Openreach Handover Point (OHP) to a Communications Provider's site.
Business Connectivity Market Review (BCMR)	This market review of which this consultation on leased lines charge control forms a part.
Call for Input (the CFI)	The document issued by Ofcom at the start of this review seeking initial stakeholder input.
Capital expenditure (capex)	The firm's level of investment in fixed assets over the course of the financial year.
Central Business District (CBD)	These are central business districts of urban centres in Birmingham, Bristol, Glasgow, Leeds and Manchester, as defined in the May 2015 BCMR Consultation.
Central and East London Area (CELA)	The geographic market covering central and east London as defined by Ofcom in the 2007/8 Review.
Central London Area (CLA)	A proposed geographic market in central London set out in the May 2015 BCMR Consultation.
Contemporary Interface (CI)	A set of modern technologies used for delivery of leased line services (e.g. Ethernet or wavelength-division multiplexing).
Contemporary interface symmetric broadband origination (CISBO)	A service defined in the May 2015 BCMR Consultation consisting of wholesale leased line services using CI technologies.
Communications Provider (CP)	An organisation that provides electronic communications services.
Consumer price index (CPI)	The consumer price index (CPI) is a measure of inflation. It measures changes in the price level of consumer goods and services purchased by households. The most significant item excluded in the CPI, but included in the RPI, is mortgage interest rate payments.

Contractor ECCs	Construction activities that Openreach provides through an external contractor.
Cost Volume Elasticity (CVE)	The percentage increase in operating costs for a 1% increase in volume.
Core Transmission Costing System (CTCS)	A BT core network costing system which models the volumes and network usage associated with the transmission across the BT Core network.
Cumulative OCM depreciation (Cum OCM dep)	The sum of the individual in-year OCM depreciation over the asset life up to the year being forecast, adjusted to reflect any changes in asset values over time.
Current Cost Accounting (CCA)	An accounting convention, where assets are valued and depreciated according to their current replacement cost whilst maintaining the operating or financial capital of the business entity.
Customer Sited Handover (CSH)	An interconnection between BT and another communications provider where the BT handover circuit terminates at the communications provider's premises.
Detailed Attribution Methods 2014 (DAM)	BT Group, *Detailed Attribution Methods 2014*, 15 August 2014, http://www.btplc.com/Thegroup/RegulatoryandPublicaffairs/Financialstatements/2014/DAM2014.pdf
Digital Private Circuit Network (DPCN)	A BT network that is used to provide very low bandwidth TI leased lines services (services at bandwidths below 2Mbit/s)
Digital Subscriber Line (DSL)	A family of technologies generically referred to as DSL or xDSL that enable the transmission of broadband signals over ordinary copper telephone lines. ADSL (Asymmetric Digital Subscriber Line), HDSL (High bit rate Digital Subscriber Line) and VDSL (Very high data rate Digital Subscriber Line) are all variants of xDSL.
Direct ECCs	Construction activities that Openreach provides through its own staff.
Distributed long run incremental cost (DLRIC)	The LRIC of the individual service with a share of costs which are common to other services over BT's core network.
Disposals (Disp)	The assets that the firm disposes of (e.g. an asset that becomes fully depreciated or an asset that the firm sells) over the course of the financial year.
Distributed stand alone cost (DSAC)	An accounting approach estimated by adding to the DLRIC a proportionate share of the inter-increment common costs. Rather than all common costs shared by a service being allocated to the service under consideration, the common costs are instead allocated amongst all the services that share the network increment.

Equi-proportional Mark-Up (EPMU)	The application of the same percentage mark-up to the incremental costs of two or more services.
Ethernet	A packet-based technology originally developed for and still widely used in Local Area Networks. Ethernet networking protocols are defined in IEEE 802.3 and published by the Institute of Electrical and Electronic Engineers. Developments of this technology known as Metro Ethernet or Carrier Ethernet are now being used in communications providers' networks to provide leased line and backhaul services.
Ethernet Access Direct (EAD)	A BT wholesale Ethernet product offered by Openreach providing high bandwidth, point-to-point connections.
Ethernet Backhaul Direct (EBD)	A BT wholesale Ethernet backhaul product providing high bandwidth, inter-exchange connectivity between designated BT exchanges.
Ethernet in the First Mile (EFM)	A network technology for the delivery of Ethernet services over access networks. Although the technology also encompasses fibre access networks, in common usage, EFM refers to the provision of Ethernet services over copper access networks.
Excess Construction Charges (ECCs)	A charge levied by BT where additional construction of duct and fibre or copper is required to provide service to a customer premise.
ECC Direction	Ofcom, *Excess Construction Charges for Openreach Ethernet Access Direct, Directions affecting the operation of the Leased Lines Charge Control, Statement*, 16 May 2014, http://stakeholders.ofcom.org.uk/binaries/consultations/excess-construction-charges/statement/excess-construction-charges-statement.pdf (May 2014 ECC Direction).
Fibre Channel	Standardised storage area network protocol operating at bandwidths between 1Gbit/s and 16Gbit/s
Financial Capital Maintenance (FCM)	An alternative approach to CCA in which an allowance is made within the capital costs for the holding gains or losses associated with changes over the year in the value of the assets held by the firm. In contrast to OCM, the FCM approach seeks to maintain the financial capital of the firm, and hence the firm's ability to continue financing its functions.
Fully allocated cost (FAC)	An accounting approach under which all the costs of the firm are distributed between its various services.
Gbit/s	Gigabits per second (1 Gigabit = 1,000,000,000 bits) A measure of bandwidth in a digital system.

General Building Cost Index (GBCI)	A national index that measures the costs of construction work including materials and labour.
Gross Replacement Cost (GRC)	The Current Cost Accounting (CCA) equivalent of Gross Book Value, i.e. the cost of BT replacing its assets with new ones now.
Holding gains and losses (HGL)	The change in the value of the underlying assets used by the company over the course of the financial year
HCA (historical cost accounting) depreciation	The measure of the cost in terms of its original purchase price of the economic benefits of tangible fixed assets that have been consumed during a period. Consumption includes the wearing out, using up or other reduction in the useful economic life of a tangible fixed asset whether arising from use, effluxion of time or obsolescence through either changes in technology or demand for the goods and services produced by the asset.
Hull Area	The area defined as the 'Licensed Area' in the licence granted on 30 November 1987 by the Secretary of State under section 7 of the Telecommunications Act 1984 to Kingston upon Hull City Council and Kingston Communications (Hull) plc.
In Building Handover (IBH)	An interconnection between BT and another communications providers' network where the handover takes place at collocation space rented by a CP in a BT local exchange.
Inflation	The general change in prices across the economy.
Input price changes (IPC)	Changes in the prices of the underlying inputs to costs. This includes changes to assets prices and changes to operating costs.
Internet Protocol (IP)	A network technology used in packet-switched networks to route packets across network nodes.
ISDN	A digital telephone service that supports telephone and switched data services.
ISDN30	A digital multiline telephone service conforming to the ISDN Primary Rate Access standard as defined by the ITU.
Holding gains and losses (HGL)	The change in the value of the underlying assets used by the company over the course of the financial year
June 2015 LLCC Consultation	This document.
June 2015 Cost Attribution Review	The consultation that will be published shortly and is relevant to the proposals within the June 2015 LLCC Consultation.

July 2009 LLCC Statement	The statement published in 2009 implementing charge controls in wholesale leased lines markets. See Annex 15 for links to this document.
kbit/s	Kilobits per second (1 kilobit = 1,000 bits) A measure of bandwidth in a digital system.
Leased line	A permanently connected communications link between two premises dedicated to the customers' exclusive use.
Local Area Network (LAN)	A network typically linking a number of computers together within a business premise, enabling intercommunication between users and access to email, internet and intranet applications.
Local loop	The access network connection between the customer's premises and the local serving exchange, usually comprised of two copper wires twisted together.
Local Loop Unbundling (LLU)	A process by which a dominant provider's local loops are physically disconnected from its network and connected to competing provider's networks. This enables operators other than the incumbent to use the local loop to provide services directly to customers.
London Periphery	A proposed geographic market set out in the May 2015 BCMR Consultation and adjacent to the CLA.
Long Run Incremental Cost (LRIC)	The cost caused by the provision of a defined increment of output given that costs can, if necessary, be varied and that some level of output is already produced.
March 2013 BCMR Statement	The statement published in 2013 implementing charge controls in wholesale leased lines markets. See Annex 15 for links to this document.
May 2015 BCMR Consultation	The consultation published in May 2015 setting out our provisional analysis of the leased lines market and identifies segments of the market in which we propose that a provider has SMP. See Annex 15 for links to this document.
Mbit/s	Megabits per second (1 Megabit = 1 million bits). A measure of bandwidth in a digital system.
Mean capital employed (MCE)	The mean value of the assets that contribute to a company's ability to generate revenues. BT's definition of Mean Capital Employed is total assets less current liabilities, excluding corporate taxes and dividends payable, and provisions other than those for deferred taxation. The mean is computed from the start and end values for the period, except in the case of short-term investments and borrowings, where daily

	averages are used in their place.
Modern equivalent asset (MEA)	The approach to set charges by basing costs and asset values on what is believed to be the most efficient available technology that performs the same function as the current technology.
Multiple Interface (MI) leased lines	Leased line services with bandwidths greater than 1Gbits/s and leased lines services of any bandwidth delivered using WDM equipment at the customer's premises.
Multiple Interface Symmetric Broadband Origination (MISBO)	Leased line terminating segments supporting high bandwidth services – either an Ethernet interface with bandwidths greater than 1Gbit/s or services of any bandwidth/interface delivered using WDM equipment at the customer's premises.
Net current assets (NCA)	A measure of the amount of capital being used in day-to-day activities by the company. It is equal to the current assets less current liabilities.
Net replacement cost (NRC)	The CCA equivalent of Net Book Value, i.e. depreciated replacement cost of BT's assets.
Next generation access (NGA)	A new or upgraded access network capable of supporting much high capacity broadband services than traditional copper access networks. Generally an access network that employs optical fibre cable in whole or in part.
Next Generation Network (NGN)	An IP based multi-service network capable of providing voice telephony, broadband and other services.
November 2014 BCMR Passives Consultation	The November 2014 consultation forming part of the BCMR.
Openreach Handover Point (OHP)	Nodes in BT's network at which certain Openreach backhaul services are terminated.
Openreach Network Backhaul Services (ONBS)	A BT wholesale Ethernet backhaul service providing high bandwidth inter-exchange connectivity.
Operating capability maintenance (OCM)	A CCA convention, where the depreciation charge to the profit and loss account relates to the current replacement cost of the firm's assets, taking account of specific and general price inflation. As the name suggests, the OCM approach seeks to maintain the operating capability of the firm.
OCM depreciation	The reduction in value (as measured by the GRC) of the assets over the course of the financial year associated with the reduction in the asset's

(OCM dep)	remaining life.
Operating expenditure	Costs reflected in the profit and loss account excluding depreciation financing costs such as interest charges.
Optical Spectrum Access (OSA)	A BT wholesale WDM service.
Optical Spectrum Extended Access (OSEA)	A BT wholesale WDM services supporting longer circuits than OSA.
Other Communications Providers (OCPs)	A communications provider other than BT.
Partial Private Circuit (PPC)	A generic term used to describe a category of private circuits that terminate at a Point of Connection between two communications providers' networks. It is therefore the provision of transparent transmission capacity between a customer's premises and a point of connection between the two communications providers' networks.
Plesiochronous Digital Hierarchy (PDH)	An older digital transmission technology that uses Time Division Multiplexing. Although PDH systems are is still in widespread use, they are being replaced by SDH and increasingly Ethernet services.
Point of Handover (POH)	A point where one communications provider interconnects with another communications provider for the purposes of connecting their networks to 3rd party customers in order to provide services to those end customers.
Points of Connection (POC)	A point where one communications provider interconnects with another communications provider for the purposes of connecting their networks to 3rd party customers in order to provide services to those end customers.
Previously Allocated Costs (PAC)	BT's cost attribution system (see section 5 of the June 2015 Cost Attribution Review) allocates costs to the different levels of their cost exhaustion system. When we propose that these costs should be allocated based on all previously allocated total costs we mean that each division, market, service, and component (i.e. the different levels of the cost exhaustion system) should be allocated these costs based on the previously allocated total costs at that level of the cost exhaustion system divided by the total of all previously allocated total costs within BT as shown in the following formula $x = \textbf{OUC costs X } [\frac{\textbf{Previously allocated total costs at level x}}{\textbf{Total previously allocated total costs within BT}}]$, where x = allocation of the OUC's costs at a specific level of BT's cost exhaustion system.
Public Switched	A telecommunications network that uses circuit switched technology to

Telephone Network (PSTN)	provide voice telephony services.
Quality of service (QoS)	An assessment or measure of how well a delivered service such as provision and repair conforms to the customer's expectations.
Radio Base Station (RBS) backhaul circuit	A circuit provided by BT that connects a mobile communications provider's base-station to a mobile communications provider's mobile switching centre.
Regulatory asset value (RAV)	The value ascribed by Ofcom to an asset or capital employed in the relevant licensed business.
Regulatory financial statements (RFS)	The financial statements that BT is required by Ofcom to prepare, have audited and publish available at: http://www.btplc.com/thegroup/RegulatoryandPublicaffairs/Financialstatements/index.htm
Rest of the UK (RoUK)	A proposed geographic market set out in the May 2015 BCMR Consultation, consisting of an area outside the CLA, the LP and the Hull Area.
Retail price index (RPI)	A measure of inflation published monthly by the Office for National Statistics. It measures the change in the cost of a basket of retail goods and services.
Return on capital employed (ROCE)	The ratio of accounting profit to capital employed. The measure of capital employed can be either Historic Cost Accounting (HCA) or Current Cost Accounting (CCA).
Revised agreement for Access Network Facilities (RANF)	The Reference Offers which set out revised terms and conditions on which Openreach will provide local loop unbundling services: https://www.openreach.co.uk/orpg/home/products/llu/contracts/contracts.do
Sales Product Management (SPM)	A network cost component.
Service Level Agreement (SLA)	A contract between a network service provider and a customer that specifies, usually in measurable terms, what services the network service provider will furnish.
Service Level Guarantee (SLG)	A contractual agreement specifying the compensation payable if the service provider fails to deliver the agreed service performance.
Significant market power (SMP)	The significant market power test is set out in European Directives. It is used by National Regulatory Authorities (NRAs), such as Ofcom, to identify those CPs which must meet additional obligations under the relevant Directives.

Statement of Requirement (SoR)	A BT process for submission and processing of requests for product/service enhancements.
Stand Alone Cost (SAC)	An accounting approach under which the total cost incurred in providing a product is allocated to that product.
Sub-basket	A sub-basket refers to a control on a group of two or more charges.
Sub-cap	A sub-cap refers to a control on a single charge.
Symmetric broadband origination (SBO)	A symmetric broadband origination service provides symmetric capacity from a customer's premises to an appropriate point of aggregation, generally referred to as a node, in the network hierarchy. In this context, a "customer" refers to any public electronic communications network provider or end-user.
Symmetric Digital Subscriber Line (SDSL)	A DSL variant that allows broadband signals to be transmitted at the same rate from end user to exchange as from exchange to end user.
Synchronous Digital Hierarchy (SDH)	A digital transmission standard that is widely used in communications networks and for leased lines.
Tender Price Index (TPI)	A national index that measures tenders prices charged for construction work.
The Act	The Communications Act 2003.
Time-limited discount	A temporary reduction in the charge for a service. After a certain period of time, the relevant charge is set back to its original level (before the change was implemented).
Total cost of ownership (TCO)	The total price of a service, including all incurred charges, over a specified period.
Traditional Interface (TI) Leased Lines	Leased lines services with an ITU G.703 Interface.
Traditional interface symmetric broadband origination (TISBO)	Leased line terminating segment with an ITU G.703 interface.
Virtual Private Network (VPN)	A technology allowing users to make inter-site connections over a public telecommunications network that is software partitioned to emulate the service offered by a physically distinct private network.

Wavelength Division Multiplex (WDM)	An optical frequency division multiplexing transmission technology that enables multiple high capacity circuits, to share an optical fibre pair by modulating each on a different optical wavelength.
Weighted average cost of capital (WACC)	The rate that a company is expected to pay on average to all its security holders to finance its assets.
Western, Eastern, Central and East London Area (WECLA)	The geographic market defined by Ofcom in the March 2013 BCMR Statement.
Wholesale Broadband Access (WBA) Market	The wholesale market for fixed broadband services.
Wholesale end-to-end service (WEES)	A BT wholesale Ethernet product that can be used to provide a point-to-point connection between two customer's sites.
Wholesale Extension Service (WES)	A BT wholesale Ethernet product that can be used to link a customer premise to a node in a communications network.
Wholesale Line Rental (WLR)	A remedy that requires BT to rent telephone lines to CPs on a wholesale basis.
Wholesale Local Access (WLA) Market	The wholesale market for fixed telecommunications infrastructure, specifically the physical connection between end users' premises and a local exchange.