

Annex 29

Efficiency

Introduction

- A29.1 As set out in Volume II, Sections 5 and 6, 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.
- A29.2 In reaching our regulatory judgement on the appropriate efficiency target we consider a range of 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.
- A29.3 In this section we set out our analysis used to derive our efficiency assumptions. We review each of the different sources of evidence, including evidence from stakeholders from our June 2015 LLCC Consultation and the November 2015 LLCC Consultation and present our conclusions and decisions.

Summary

- A29.4 We have decided to adopt an efficiency target for Ethernet services of 5.0% for operating costs and 4.0% for capital expenditure, and an efficiency target for TI services of 4.5% for operating costs. We make no assumption about efficiency on capex for TI services as there is no capital expenditure forecast for TI services in the 2016 LLCC Model as volumes are declining.
- A29.5 To establish these 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 operating cost forecasting formulae within the 2016 LLCC Model;
 - analysed both historical and forecast BT management accounting information that identifies cost transformation and efficiency targets for various BT divisions;
 - reviewed information originating from outside BT. This included various benchmarking studies undertaken for BT together with various telecoms specific and economy wide studies including estimates made by other regulators; and
 - reviewed other public information about BT's cost performance such as public statements made by BT itself and brokers' and analysts' reports.
- A29.6 We have assessed efficiency on capital expenditure separately to that on operating costs.

Overall context

June and November 2015 LLCC Consultations

A29.7 In the June 2015 LLCC Consultation we proposed an efficiency range of 4 to 7% and a base case efficiency target of 5% for Ethernet and TI services for both operating costs and capex. In our November 2015 LLCC Consultation we revised our efficiency range for TI services to 2 to 6%. Our efficiency range for Ethernet services and our base case efficiency targets for Ethernet and TI services did not change.

Stakeholders' comments

- A29.8 In its response to the June 2015 LLCC Consultation BT considered *"the efficiency target for TI services should be unchanged [from the 2013 LLCC assumption] at 1.5%".* BT provided evidence that *"points to a range of 1% to 2% p.a. efficiency as being reasonable for TI services".* This evidence was from *"a wide range of sources, both internal and external to BT, both on a historic as well as on a forecast basis".*¹ For Ethernet services BT considered *"a range of 2% to 5% takes into account the rate of general technological progress and some degree of further catch-up compared to best practice".*² This range was based on *"a more balanced view (which) would (...) place some weight on the data that is external to BT in order to check the overall reasonable of the assumptions"*³. BT's central estimate for Ethernet services was 3.5%.⁴
- A29.9 In its response to the November 2015 LLCC Consultation BT again considered that *"[it] would expect TI efficiency to be close to 1.5%".*⁵ For Ethernet services, BT did not provide any updated views on the general level of efficiency but rather more detailed comments about certain aspects of our efficiency analysis. BT claimed that the results of its updated calculations generally supported an assumption within the range of 3 to 4%.⁶
- A29.10 [3<] considered that *"the efficiency range is broadly consistent with Ofcom's previous remedies"*.⁷
- A29.11 GTC considered that *"the efficiency target for Ethernet services should be higher than 5% based on the evidence provided by Ofcom ... [as] 5% appears to be at the very lower bound of efficiency estimates for Ethernet".* Further, although 5% *"is higher than targets used in previous charge controls, it is lower than the central range of estimates examined by Ofcom"*. GTC also thought that *"Ofcom should consider providing a specific efficiency target for Ethernet"* and that *"by adopting a single efficiency across all TI and Ethernet services, Ofcom risks overestimating*

¹ BT response to the June 2015 LLCC Consultation – Main Response, August 2015, P.98, paragraph 519 http://stakeholders.ofcom.org.uk/binaries/consultations/llcc-dark-fibre/responses/BT_Main_Response.pdf

² BT response to the June 2015 LLCC Consultation – Annex E, August 2015, P.2, paragraph 8

³ BT response to the June 2015 Consultation – Main Response, August 2015, page 54, paragraph 233

⁴ BT response to the June 2015 Consultation – Main Response, August 2015, page 49, Table 12

⁵ BT response to the November 2015 Consultation, December 2015. Page 8, paragraph 32

⁶ BT response to the November 2015 Consultation, December 2015. Pages 9 and 10, see for example paragraphs 38, 39, and 41.

⁷ [3<]

*efficiency for TI services, and underestimating efficiency ...for Ethernet services”.*⁸

- A29.12 TalkTalk noted that *“Ofcom has chosen a base case efficiency assumption that is not the mid-point of its range” without explaining why.* TalkTalk considered that *“Ofcom should use the mid-point (i.e. 5.5%)”* and noted that *“BT claim it will achieve £360m of efficiency gains though its proposed merger with EE”* and that *“the efficiency gain assumption should reflect the benefit of the merger”.*⁹
- A29.13 UKCTA considered that *“historically BT has frequently achieved savings in excess of those predicted”.* UKCTA was concerned that *“Ofcom’s proposed 5% assumption, within the suggested 4% to 7% range, falls well short of what will be achieved in practice”* on the basis that *“volumes will rise ... together with BT’s plans to develop new synergies ... for example as a result of their announced M&A activity”.* UKCTA said that *“it is of concern that Ofcom’s past predictions have tended to be on the low side. Our view is that this next LLCC represents a significant opportunity to reverse the trend of underestimation and ensure the setting of efficiency targets for the business connectivity sector that truly challenge BT to deliver meaningful changes.”*¹⁰
- A29.14 Vodafone referred to a report it commissioned from Frontier in which *“Frontier concludes Ofcom’s proposal to use efficiency assumptions of 5% for both the TI and Ethernet charge controls is conservative. By choosing a conservative estimate rather than a central estimate with a balanced upside and downside, Ofcom will reduce the level of allocative efficiency by setting the overall level of prices higher than necessary, with no clear offsetting benefits in terms of productive or dynamic efficiency”.* Further it commented that *“past performance suggests that the rate of efficiency gains has been in a range with a lower bound of around 5%”,* that *“there is no reason to expect that similar efficiency gains could not be made over the period of the next charge control”* and that *“by selecting a point at the bottom of the range Ofcom risks underestimating what is achievable”.*¹¹
- A29.15 Vodafone did not agree with BT’s claim that the efficiency target for the TI basket should be significantly lower to reflect the maturity of the TI market. Vodafone’s view was that *“TI specific costs form only a small proportion of the overall TI cost base, with other costs coming from a wide range of services (e.g. duct, fibre, copper, buildings and central costs)”.* Therefore *“the maturity of the TI market is entirely irrelevant to the rate of efficiency improvement possible for such shared costs and as a result it is important that these shared cost efficiency opportunities are captured within the TI efficiency assumption”.*¹²

⁸ GTC response to the June 2015 LLCC Consultation, August 2015, P.4

<http://stakeholders.ofcom.org.uk/binaries/consultations/lcc-dark-fibre/responses/GTC.pdf>

⁹ TalkTalk response to the June 2015 LLCC Consultation, August 2015, P.71

<http://stakeholders.ofcom.org.uk/binaries/consultations/lcc-dark-fibre/responses/TalkTalk.pdf>

¹⁰ UKCTA response to the June 2015 LLCC Consultation, August 2015, P.12-13

<http://stakeholders.ofcom.org.uk/binaries/consultations/lcc-dark-fibre/responses/UKCTA.pdf>

¹¹ Vodafone response to the June 2015 LLCC Consultation, August 2015, p. 31-32

<http://stakeholders.ofcom.org.uk/binaries/consultations/lcc-dark-fibre/responses/Vodafone.pdf>.

Frontier’s report contains further comments, see [3<]

¹² Vodafone response to November 2015 LLCC consultation, p.6

<http://stakeholders.ofcom.org.uk/binaries/consultations/bcmr-update-proposed-leased-lines-charge-controls/responses/Vodafone.pdf>

Our conclusions

A29.16 As explained in the remainder of this Annex, based on our updated analysis and having considered the comments and evidence provided by stakeholders we have decided to adopt an efficiency target for Ethernet services of 5.0% for operating costs and 4% for capital expenditure, and an efficiency target for TI services of 4.5% for operating costs.

Our approach to defining and considering efficiency gains

June 2015 LLCC Consultation

A29.17 In the June 2015 LLCC Consultation we provided an explanation of how we defined and considered efficiency gains including a summary of our approach.¹³

Stakeholders' comments on our general approach

A29.18 We received comments from two stakeholders on our overall approach: BT and Vodafone. We consider stakeholders' more detailed comments on particular pieces of evidence or analysis when reviewing the relevant evidence or analysis.

A29.19 BT commented on our overall approach within its responses to both the June and November consultations. Firstly, BT considered that we had placed undue weight on BT's own internal data. As a result *"Ofcom does not consider a number of alternative sources of information with regards to total factor productivity for the telecoms sector, across the regulated sectors and for the UK economy as a whole. This evidence, some estimated over a long time period, shows consistent results that Ofcom omits in its assessment despite its view that this is equivalent to the efficiency measure used in its model"*.¹⁴

A29.20 Secondly, BT made some general comments on our use of internal BT data. It considered that we had not made allowances for measurement errors but also that the internal management accounting data we had analysed was based on *"BT's internal targets that are deliberately ambitious and that it would be 'damaging if charge controls were based on them'"*¹⁵ as:

- setting controls on the *"basis of ... aspirational ... rather than unbiased estimates of future efficiencies, does not appear to be consistent with a conservative and cautious approach, as would be expected from regulatory best practice"*.¹⁶
- this would *"undoubtedly dampen future incentives for outperformance"*. BT referred to the "ratchet effect" whereby *"in a repeated price setting set-up, good performance is 'rewarded' in the subsequent price setting via higher expectations for further efficiency savings"*.¹⁷

A29.21 BT quoted from the Competition Commission in a 2010 Determination that the *"target set by Ofcom for Openreach is not necessarily wrong merely because it can be exceeded, or because a plan to exceed it is adopted. In a system of incentive-*

¹³ See Annex 8 of the June 2015 LLCC Consultation

¹⁴ BT response to the June 2015 LLCC Consultation – Annex E, August 2015, P.2, paragraph 7

¹⁵ BT response to the June 2015 LLCC Consultation – Annex E, August 2015, paragraph 38, page 12

¹⁶ BT response to the June 2015 LLCC Consultation – Annex E, August 2015, paragraph 39, page 12

¹⁷ BT response to the June 2015 LLCC Consultation – Annex E, August 2015, paragraph 40, page 12

based regulation, efficiency targets should be capable of being met and exceeded".¹⁸ It also quoted Deloitte's report that describes Ofcom's approach as *"removing the incentives to "beat the target" undermines the positive incentive properties of the RPI-X price control"* and that *"whilst other regulators appear to be moving to a more incentive-compatible form of regulation, it appears that Ofcom is more focussed on more short term cost-based regulation and foregoing the long term dynamic efficiency benefits"*.¹⁹

A29.22 Thirdly, BT was critical that we had not separately identified "catch up" and "frontier shift" elements within our efficiency assumption. BT said that this resulted in the following problems:

- it made it difficult to make a direct like for like comparison with efficiency assessments made by other regulators;²⁰
- Ofcom had *"not demonstrated sufficient evidence for either components of efficiency"* and had not *"checked the consistency of its assumptions, even against evidence it has considered."*²¹

A29.23 Vodafone considered that BT's regulated business has *"a number of discretionary practices that are unique to the industry (e.g. no compulsory redundancies, staff spending long periods of time in BT's Career Transition Centre). Further, the existence of these practices illustrate the potential for further efficiencies and show that past charge controls haven't provided a sufficient incentive to BT to remove them"*.²² Vodafone considered that *"Ofcom should either exclude discretionary practices from the cost base in the form of a cost adjustment or set an efficiency assumption that results in UK consumers and businesses and consumers no longer funding them"*.²³

Our conclusions

Definition of efficiency gains

A29.24 We apply our efficiency rate to each and every year between our base year in our Statement (2014/15) and the last year of the charge control (2018/19). We are therefore estimating the average annual efficiency rate over this period.

A29.25 The efficiency rate needs to be consistent with its application within the formulae within the charge control model. The way in which the efficiency assumption is used within the 2016 LLCC Model is described in Annex 26. 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

¹⁸ Competition Commission, Case 1111/3/3/09, August 2010, Paragraph 2.191 quoted in BT response to the June 2015 LLCC Consultation – Annex E, August 2015, paragraph 33, page 11

¹⁹ BT response to the June 2015 LLCC Consultation – Annex E, August 2015, paragraph 44, page 14

²⁰ BT response to the June 2015 LLCC Consultation – Annex E, August 2015, paragraph 27, page 9

²¹ BT response to the June 2015 LLCC Consultation – Annex E, August 2015, paragraph 27, page 9

²² Vodafone response to the June 2015 LLCC Consultation, August 2015, paragraphs 5.1 and 5.2, p.30 <http://stakeholders.ofcom.org.uk/binaries/consultations/llcc-dark-fibre/responses/Vodafone.pdf>

²³ Vodafone response to the June 2015 LLCC Consultation, August 2015, paragraph 5.2, p.30 <http://stakeholders.ofcom.org.uk/binaries/consultations/llcc-dark-fibre/responses/Vodafone.pdf>

state capex are calculated in a similar way from the previous year's steady state 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 the previous year's gross replacement costs rather than the previous year's gross capex.

A29.26 This means that the efficiency rate:

- is an estimate of how costs may change after taking account of changes in volumes and changes in input prices;
- is applied only to cash payments: capital expenditure and all pay and non-pay operating costs, excluding depreciation;
- captures the effects of all means of delivering cost savings. It will therefore include 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
- will reflect the overall reduction in cash costs which will include costs incurred to deliver future cost savings.

A29.27 With regards to BT's concerns about the limited range of external evidence relied upon in our analysis, below we discuss our consideration of external evidence that BT has provided and other external benchmarking evidence we have considered.²⁴ When we review this evidence we need to consider how relevant it is to the services we are considering but also to the above principles. We have previously said that our efficiency measure can be thought of as a measure of BT's total factor productivity over time. By that we mean that we consider the potential for cost savings that can be made across all the factors of production, capital and labour. However, we apply our efficiency assumptions separately to operating costs (excluding depreciation) and to capital expenditure and we do not apply the same assumption to all assets; we do not apply it to depreciation or net replacement costs. So evidence that is based on analysis of changes to wider measures of capital costs will therefore be less relevant.

A29.28 We also note that our analysis of regulatory cost information²⁵ is an analysis of real unit operating efficiency (RUOE) that is directly relevant to the services we are considering and is consistent with the above principles.

A29.29 We discuss BT's concern that its internal management forecasts reflect ambitious "stretch" targets when we discuss our analysis of BT's management accounting information.²⁶ Regarding measurement errors, in general, we have no reason to believe that the data we have analysed has resulted in an over- or under-estimation of efficiency. Any such specific instances where we think this may be the case are noted in our analysis below.

A29.30 With respect to the incentive aspects of our efficiency assumption we addressed similar concerns made by Openreach within the June 2014 FAMR Statement. We said then that *"our view is that the incentives on Openreach to reduce costs would be stronger if charge controls could be set completely independently of*

²⁴ See paragraphs A29.154 to A29.198 below

²⁵ See paragraphs A29.52 to A29.85 below

²⁶ See paragraphs A29.106 to A29.110 below

Openreach's actual costs". Then, as now, we found difficulty in assembling relevant evidence that was not based on BT's actual costs. We explained that "[w]hile this means that efficiency gains made by Openreach in the future may be expected to influence the setting of any future efficiency targets for price regulation, we consider the potentially detrimental effect this may have on Openreach's incentives is mitigated by the incentives inherent in price cap regulation (i.e. to outperform the control once set), and by our use of glide paths".²⁷ We concluded by saying that "[o]ur view is that we have set a challenging but achievable target. Our intention is not to set a target that will be easy to meet, nor to set a target that would be impossible to outperform".

- A29.31 We adopt the same reasoning within this charge control. Our objective is to set a challenging but achievable target. We need to balance that the target should not be easy to meet but also that it "*should be capable of being met and exceeded*".²⁸
- A29.32 In response to BT we have not considered 'catch up' and 'frontier shift' efficiency targets.²⁹ In previous charge controls, predating the 2013 LLCC, we have analysed efficiency in terms of these two separate components given relevant and reliable benchmarking data. That data however is no longer a relevant source of information³⁰ and we have not been able to identify another to replace it.
- A29.33 It is also not clear what or who are the appropriate benchmarks against which to measure catch up and frontier shift. As we note below in our review of public statements³¹ Tony Chanmugam, BT Group Finance Director has stated that "*the sector isn't always the most efficient*."³² Under a catch up and frontier shift model of efficiency the frontier should be that for an efficient comparator.
- A29.34 An analysis of catch up and frontier shift efficiency is a means to establishing an appropriate efficiency target but it is not the only way. We consider that the internal data from BT is more reliable in establishing what a reasonable level of cost savings might be over the charge control period for these charge controls.
- A29.35 Vodafone made similar claims that BT's regulated business has a number of discretionary working practices within the 2014 FAMR. As in that review we disagree with Vodafone's proposal that we should make a base year adjustment or somehow reflect Vodafone's claims explicitly within our efficiency assumption.
- A29.36 As we said in the 2014 FAMR Statement; "*Our approach for these charge controls has been to model BT's existing costs and project efficiency savings, which implicitly includes labour efficiencies. Within the framework of a top-down cost model, we have not made a bottom-up assessment of particular areas of cost*

²⁷ June 2014 FAMR Statement, Annex 16, paragraphs A16.21 to A16.31

²⁸ Competition Commission, Case 1111/3/3/09, August 2010, Paragraph 2.191 quoted in BT response to the June 2015 LLCC Consultation – Annex E, August 2015, paragraph 33, page 11

²⁹ 'Catch up' is the change in costs required to bring an operator in line with those of an efficient benchmark comparator. 'Frontier shift' is the movement in efficiency expected by the efficient benchmark comparator given technological progress)

³⁰ The data we refer to related to Local Exchange Carriers (LECS) in the US. Actions taken by the Federal Communication Commission (FCC) taken in the AT&T Cost Assignment Forbearance Order, the ARMIS Forbearance Order, and the ARMIS Financial Reporting Forbearance Order, resulted in major revisions to ARMIS data filed for reporting year 2008. Since then the data used in these studies has not been available. The available data is therefore now over 7 years old.

³¹ See paragraphs A29.200 to A29.227 below

³² Vodafone response to June 2015 Consultation, p31, paragraph 5.5

*savings. Instead, we start from aggregate top-down cost information and apply an overall efficiency factor to remove aggregate level inefficiencies but capture sector-wide expected gains in productivity. This fits with the principle that the incentives inherent in price-cap regulation should drive greater efficiencies over time, and avoids the regulator micro-managing how particular efficiencies should be realised, particularly as the regulated firm is typically best placed to decide how to use different inputs most efficiently”.*³³

A29.37 Vodafone’s submission to this review does not provide us with sufficient evidence to warrant a change in our approach. We also note that our assessment of BT’s pay for the 2014 FAMR Statement concluded that it was not out of line with industry comparators.³⁴

A29.38 Finally BT made several comments that it would expect efficiency savings on TI services to be low given “the maturity of the TI market”.³⁵ As noted above³⁶ Vodafone did not agree that efficiency should be lower in the TI market as there are few TI specific costs and efficiencies on costs that are shared with other services should be captured when estimating TI efficiency. Our analysis suggests that there are relatively few operating costs that appear to be TI specific.³⁷ Our revised analysis of efficiency that we describe in the rest of this annex takes account of the cost mix for TI services.

Efficiency assumptions adopted in other recent charge controls

We observe the efficiency assumptions that we have adopted in other recent charge controls

June 2015 LLCC Consultation

A29.39 In the June 2015 LLCC Consultation we set out the efficiency assumptions used in recent telecoms charge controls. We noted these assumptions were largely based on estimates for individual BT divisions. For example in the 2013 LLCC we based the efficiency assumption for TI services largely on estimates of BT Wholesale’s efficiency, and for Ethernet services largely on estimates of Openreach’s efficiency.

A29.40 In addition, we noted BT’s recent financial performance as relevant context for considering these past efficiency assumptions used in recent telecoms charge controls. Finally we noted the results of some modelling that we had undertaken using the 2013 LLCC model that provided some support for the view that improvements in efficiency for both Ethernet and TI services had been higher than we had forecast for the 2013 LLCC.

³³ June 2014 FAMR Statement, Annex A16, paragraph A16.99

³⁴ June 2014 FAMR Statement, Annex A13, paragraphs A13.165 to A13.167

³⁵ See for example BT response to June consultation, page 98, paragraph 516

³⁶ See paragraph A29.15 above

³⁷ The largest element of operating costs excluding depreciation that might be TI specific is likely to be accommodation costs, where dedicated space is required for TI equipment. 30-40% of TI operating costs are in more general sectors, such as General Management and General Support and there may be more in other sectors. See for example Table 6.1.1, page 31 of BT’s 2014/15 Revised RFS.

Stakeholders' comments

A29.41 BT commented that *"Ofcom's summary of efficiency assumptions used in previous charge controls as a 'context and a base' to set its proposed range entrenches its approach rather than providing evidence to support our current analysis"*.^{38 39}

A29.42 In addition, BT also commented that we were wrong to include the costs of TSO in our analysis of TI efficiency as *"The BT TSO PVEO has a limited contribution to any efficiency target for BT Wholesale"*.⁴⁰

Our conclusions

A29.43 We remain of the view that past decisions provide a context from which to assess our decision. However, we consider a wide range of evidence when deciding appropriate efficiency targets and as we explain in the sections below we have updated and refined our approach in several areas.

A29.44 The efficiency assumptions we adopted in recent fixed telecoms charge controls are summarised in Table A29.1 below.

Table A29.1: 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% ⁴¹	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% ⁴²	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% ⁴³	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% ⁴⁴	2014/15 - 2016/17	Applied to operating costs and capital expenditure Based largely on estimates of Openreach's efficiency.

³⁸ BT response to June 2015 LLCC Consultation, Annex E, page 13, paragraph 43

³⁹ We respond to this comment in paragraph A29.229

⁴⁰ BT response to June 2015 LLCC Consultation - Main Response, August 2015, page 102, paragraph 512 and BT response to 1st s135 tranche 2, 29 August 2014, QH6

⁴¹ See paragraphs 19.233 to 19.248, March 2013 BCMR Statement.

⁴² See paragraphs 20.318 to 20.353, March 2013 BCMR Statement.

⁴³ See paragraphs A7.191 to A7.197, June 2014 WBA Statement.

⁴⁴ See paragraphs A16.101 to A16.111, June 2014 FAMR Statement.

- A29.45 As in the June 2015 LLCC Consultation we make two observations on the relevance of these past assumptions for the purposes of setting the efficiency targets for this statement. These relate to the BT divisions that contribute costs to leased line services and to BT's recent financial performance.
- A29.46 Table A29.1 above shows our previous assumptions on efficiency estimates were largely based on individual BT division efficiency assumptions. 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.⁴⁵
- A29.47 For our June 2015 LLCC Consultation, BT provided information that showed which of its divisions contributed costs to the various LLCC markets.^{46 47} BT's evidence demonstrates that BT Wholesale accounts for relatively few operating costs ([<] 0-10]%) for TI services (and virtually none for Ethernet services) and very little capital expenditure on either set of services. However, BT's TSO division accounts for a significant proportion of costs for both TI ([<] 50-80]%) and Ethernet ([<] 20-50]%) 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, approximately [<] 20-40% and 50-80%] for TI and Ethernet services respectively.⁴⁸
- A29.48 We have reflected these views of cost coverage within our assessments of the appropriate efficiency targets for TI and Ethernet services. We believe that it is not appropriate to base our TI efficiency target on estimates of BT Wholesale efficiency alone. Rather, we consider the potential contributions from Openreach, TSO and BT Wholesale for both Ethernet and TI services. We disagree with BT that we should ignore the contribution of TSO costs when assessing efficiency for TI services. We discuss this further below.⁴⁹
- A29.49 Openreach, TSO and BT Wholesale account for the vast majority of costs in both the TI and Ethernet markets. In the rest of this annex we refer to these divisions collectively as the Relevant BT Divisions. The June 2014 FAMR Statement and the June 2014 WBA Statement adopted a 5% efficiency assumption based on the costs of these three divisions. We believe this provides a more appropriate base level against which to judge our updated efficiency assumptions for TI and Ethernet services than estimates from the 2013 LLCC.
- A29.50 The second observation concerns the wider context for this market review. We explained in Annex 5 of the June 2015 LLCC Consultation that BT had earned a return on capital that was significantly in excess of what we expected when we set the 2013 LLCC and returns in TI markets in 2013/14 were higher than they were in Ethernet markets. Further, we said that re-running the 2013 LLCC model using an efficiency assumption of 5% in conjunction with updates to other assumptions produced an outcome closer to BT's actual 2013/14 performance.⁵⁰ We said this provided some support for the view that BT's actual improvement in efficiency for

⁴⁵ See paragraphs A12.73, March 2013 BCMR Statement.

⁴⁶ BT response to 1st s135 notice dated 7 August 2014, question F3 and follow-up questions A1-3 to Question F3 in the 1st s135 notice dated 10 March 2015.

⁴⁷ BT response to the 30th s135 notice, question A1

⁴⁸ Ofcom analysis of data provided by BT in response to 30th s135 question A1.

⁴⁹ See paragraphs A29.114 to A29.117 below

⁵⁰ See Annex 5 in our June 2015 LLCC Consultation for more details.

both Ethernet and TI services was higher than we had previously forecast for the 2013 LLCC.

A29.51 We consider a range of evidence when deciding appropriate efficiency targets and as we explain in the sections below we have updated and refined our approach in several areas.

Analysis of BT's regulatory cost accounting information

Our regulatory cost analysis provides evidence of historical efficiency gains of [X] [5-10]% for each of TI services and Ethernet services.

June 2015 LLCC Consultation

A29.52 In our June 2015 LLCC Consultation we explained that we had analysed operating cost data from BT's regulatory accounts for the network components used to provide leased line services to estimate BT's historical efficiency on leased line services. We estimated how much of the annual movement in component costs was due to inflation and the effect of volumes. Efficiency was assumed to account for any remaining movement.

A29.53 We noted some issues with this analysis:

- costs may change annually for reasons other than inflation, changes in volumes or efficiency. For example, allocations may change, or new components may be introduced;
- we restricted our analysis to considering just operating costs and did not analyse capital expenditure as the data within BT's published RFS was not sufficiently granular; and
- we excluded some components from our analysis where the data was not consistent with our modelling approach.⁵¹

A29.54 The results of our analysis were given in Table A8.32 of the June 2015 LLCC Consultation which is reproduced below.

Figure A29.2: Ofcom efficiency estimates of Operating Costs from analysis of Regulatory Cost Accounting data from June 2015 LLCC consultation

	2010/11 to 2013/14 (Average over 5 years)	2011/12 to 2013/14 (Average over 3 years)
TI	2.0% pa	3.0% pa
Ethernet	8.0% pa	10.5% pa

Source: Ofcom analysis

A29.55 We noted these results were broadly consistent with our historical analysis of BT's profitability.⁵² However, as the results showed large variation from year to year, we gave this analysis low weight in determining our efficiency assumptions.

⁵¹ We excluded Access Cards (Other services), administrative components (e.g. sales product management) and components where volumes measures were inconsistent across years.

⁵² See Annex 5 of the June 2015 LLCC Consultation.

Stakeholders' comments

- A29.56 We received comments from two stakeholders: Frontier, which provided comments on behalf of Vodafone; and BT.
- A29.57 Frontier noted that Ofcom gave a low weight to RFS data. Frontier argued that the *“volatility in estimates is likely to reflect issues such as methodological changes in cost attribution not fully controlled for”*. Frontier further considered *“that long term averages should be relatively robust and importantly unbiased estimates of past efficiency”*. Frontier’s conclusion was that *“as unbiased estimates based on a residual approach we considered that these estimates should be given a relatively high weight”*.⁵³
- A29.58 BT commented separately on our analysis of TI and Ethernet network efficiency assumptions.
- A29.59 With respect to our analysis of Ethernet services’ component costs BT agreed that *“the analysis of costs using BT’s regulatory financial statements can only be carried out on operating costs”*.⁵⁴ BT felt that there would be issues with an analysis of *“capital expenditure where programs do not happen on a smoothed-incremental basis as would be implied by Ofcom’s asset volume elasticity (AVE) assumptions. Similarly, the financial accounts do not tend to be sufficiently detailed to separately identify the purpose of capital expenditure, i.e. whether it was aimed at replacing existing assets or as a result of meeting new demand”*.⁵⁵
- A29.60 BT also considered that our analysis of operating costs was too simplistic and *“one-off adjustments and other accounting changes need to be removed in order to carry out a like for like comparison”*.⁵⁶ It suggested that cumulo costs should be removed which together with other changes would reduce the historic Ethernet efficiency to *“[<] with an average of 4.5%”*. BT further suggested that its analysis showed that *“the year on year variations are not as significant as Ofcom suggest”*.⁵⁷
- A29.61 BT made similar comments with respect to our analysis of TI services’ component costs. Firstly, BT noted that Ofcom appeared to have dismissed this evidence when considering efficiency for TI services.⁵⁸ BT again argued that our analysis was overly simplistic. BT had undertaken its own analysis which removed the effects of various “one-off items” and methodology changes, including the removal of cumulo rebates and this gave historic efficiency figures of 1% (or 2% if no adjustments were made).⁵⁹ BT noted that some *“year to year fluctuation is to be expected and this is not a good reason to reject this evidence. Short term fluctuations can be overcome by taking an average over a number of years to derive a reasonable estimate”*.⁶⁰

⁵³ Frontier Consulting, June 2015 LLCC Consultation, Efficiency, August 2015, page 5

⁵⁴ BT main response to the June 2015 LLCC Consultation, August 2015, paragraph 217, page 45

⁵⁵ BT main response to the June 2015 LLCC Consultation, August 2015, paragraph 216, page 45

⁵⁶ BT main response to the June 2015 LLCC Consultation, August 2015, paragraph 218, page 45

⁵⁷ BT main response to the June 2015 LLCC Consultation, August 2015, paragraph 220, page 46

⁵⁸ BT main response to the June 2015 LLCC Consultation, August 2015, paragraph 505, page 95

⁵⁹ BT main response to the June 2015 LLCC Consultation, August 2015, paragraph 507, page 96

⁶⁰ BT main response to the June 2015 LLCC Consultation, August 2015, paragraph 509, page 96

Our conclusions

We have updated our analysis and adopted the same methodology used in the June 2015 LLCC Consultation

- A29.62 We have updated our analysis of regulatory cost data for leased line services to include cost data from BT's 2015 RFS.⁶¹ We have also taken the opportunity to refine the analysis in the light of BT's comments but also to make the analysis consistent with developments in the 2016 LLCC Model.
- A29.63 The basic methodology that underpins our analysis has not changed from that proposed in the June 2015 LLCC Consultation. We have estimated the impact of inflation and changes in volumes on the annual movement in component costs. We have assumed efficiency accounts for any remaining movement. We have again used the formulae that underpin the 2016 LLCC Model, estimating the effects of volumes using CVEs and specific Ethernet and TI service inflation assumptions for each year.
- A29.64 We have again undertaken a series of "pairwise comparisons" to minimise the effect of "system" changes (e.g. changes in accounting allocation rules from one year to the next). We compare the results for the two years reported in each RFS and thus use the restatements that BT has made, for example, for major changes in methodologies or changes in market definitions.⁶² This has not, however, necessarily addressed all the changes that BT may have made in each year's RFS; 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. By including the results from the 2014/15 RFS we have been able to analyse changes in costs over the period 2009/10 to 2014/15 (i.e. five sets of "pairwise comparisons").

We have analysed operating costs and not capital expenditure

- A29.65 As in the June 2015 LLCC Consultation, we have analysed movements in operating costs for pay and non-pay costs together.⁶³ We have not been able to use this method to assess efficiency on historic capital expenditure. As noted above, BT agreed with our views, in particular, noting that it did not record capital expenditure in terms of whether it was required to replace existing assets or to meet growth. Our ability to analyse BT's capital expenditure in a way that is consistent with the modelling approach is therefore limited. It is therefore not possible to use our analysis of regulatory cost data to inform our capex efficiency assumptions.⁶⁴

We have reviewed the necessary adjustments

- A29.66 We have again excluded certain components from our analysis notably:

⁶¹ BT response to 1st s135 notice, response to question H12 and 24th s135 response to question E1. This data did not however include the impacts of the errors that BT notified to us in February 2016. See Annex 27, paragraph A27.28.

⁶² BT is required to restate the prior year comparatives to be consistent with current year figures. Ofcom General Financial Reporting statement, May 2014, Annex 2, SMP conditions, Page 123, paragraph 11 <http://stakeholders.ofcom.org.uk/binaries/consultations/bt-transparency/statement/financial-reporting-statement-may14.pdf>

⁶³ Because of the way we have calculated CVEs and applied our inflation assumption we do not believe this is a critical assumption. Non pay costs do not include depreciation.

⁶⁴ We discuss our analysis of capital expenditure in paragraphs A29.240 to A29.264 below.

- Access cards (Other services) as the costs for these components are not included within the 2016 LLCC Model;⁶⁵
- Administrative components such as sales product management and SG&A Private circuits as the 2016 LLCC Model forecasts the costs of these components using service volumes rather than component volumes;⁶⁶ and
- Components that only relate to capital costs such as ECC credit components.

A29.67 We have also reviewed the adjustments that BT argued we should make for “one-off” items, by requesting the details of BT’s analysis.⁶⁷ As a result we have made further adjustments to our analysis to reflect various inconsistencies including:

- reversing a “mis-posting” of Service Level Guarantee revenue that occurred in 2013/14. This had been treated as a negative cost in the accounts rather than as a revenue impact;
- removing the component ‘2Mbit/s and above PC link connection cct provision’ from the pairwise comparison between the published 2011/12 figures and the 2010/11 restated results. This was to take account of a “one-off” allocation change in provisioning costs;
- removing the components ‘DSLAM overheads’, ‘core directors’ and ‘Point of handover electronics’ for the pairwise comparison between 2011/12 and 2012/13 as the volume measures for these components were not comparable in these years; and
- removing the components ‘PC rental 140Mbit/s link per km trunk’, ‘PPCs 140/155Mbit/s Trunk CELA’, ‘PC rentals 140Mbit/s regional trunk’ and ‘PC rentals 140Mbit/s national trunk’ for the pairwise between 2012/13 and 2013/14 due to a change in the CTCS treatment of trunk volumes.

A29.68 The net result was to exclude less than [\pounds £] of HCA operating costs in any year. The average across the years was [\pounds £].

A29.69 As in the June 2015 LLCC Consultation, we have not made any adjustments to reflect the changes to allocations we have made to our base year data for this control. So, for example, we have not attempted to revise historical attributions of corporate overheads or property or electricity costs.⁶⁸ We do not think this would be proportionate. In coming to this view we have balanced the risk of undertaking what would be a complex exercise and the risk of introducing errors into our analysis which then may not have a significant impact. Such an exercise is unlikely to have a significant impact because our analysis looks at the changes in costs between years not the absolute level of those costs.

⁶⁵ The treatment of Access Cards were discussed in some detail in our June 2015 LLCC Consultation. See paragraphs A7.11 to A7.20 of Annex 7 of the June 2015 LLCC consultation. BT did not attribute costs of Access Cards to leased line services in its 2015 RFS.

⁶⁶ Annex 26 describes what these components are and our treatment of them.

⁶⁷ BT response to the 24th S135 request, question E2.

⁶⁸ See Annex 27 and 28.

- A29.70 We have also excluded the costs of cumulo rates from this analysis but not for the reasons suggested by BT.⁶⁹ As business rates are part of BT's legitimate business we would normally expect to include any movement in these costs within our assessment of future cost savings. BT's cumulo rates costs have reduced significantly in recent years. Some of these cost savings have been attributed to leased line services.
- A29.71 Following the 2014 FAMR we directed BT to change the way it attributed its cumulo rates costs.⁷⁰ Results prior to the 2013/14 RFS reflected BT's previous allocation methodology so may have overstated or understated changes in costs. We requested information from BT that enabled us to estimate cumulo attributions to leased line network components in years prior to 2013/14 under the attribution methodology adopted in the 2014 FAMR.⁷¹ We then replaced BT's cumulo attributions with our revised attributions. Making this change had little impact on our previous estimates: savings in cumulo costs still contributed between [£] per annum to our estimates of historical efficiency for both Ethernet and TI services. So changing the cumulo attributions did not affect our decision to include or exclude cumulo costs from our analysis
- A29.72 From an efficiency perspective, we have considered whether historical reductions in BT's cumulo rates costs are relevant to changes in these costs from our base year, 2014/15, to the end of the charge control in 2018/19. However, forecasting BT's cumulo costs is very difficult as new rateable values (RVs) will come into force on 1 April 2017 in England, Scotland and Wales. To estimate BT's cumulo rates costs it is necessary to estimate not only how BT's RV for its cumulo assessment would change, but also how rates in the pound would change as a result of the revaluation of all assessments in England, Scotland and Wales and then whether there will be any transitional arrangements and what those might be.⁷² This cannot be done with any real degree of confidence. Currently draft RVs for the new rating list in England are only planned to be published in November 2016, i.e. after these charge controls take effect.
- A29.73 In addition, the main driver of reductions to the non-NGA element of BT's cumulo rateable value in the last few years has been changes in MPF volumes.⁷³ However growth in MPF volumes is now lower than it was previously⁷⁴ so this would suggest that reductions in BT's non-NGA cumulo rates costs up to 2016/17 might be lower than in the last few years.
- A29.74 In the light of the above uncertainties we have decided to exclude BT's cumulo rates costs from our analysis of regulatory costs. That means that we assume there are no cost savings to be made on BT's cumulo rates costs in the future.

⁶⁹ BT's cumulo rates are described in more detail in Annex 32.

⁷⁰ March 2014 Directions Statement <http://stakeholders.ofcom.org.uk/consultations/financial-reporting/statement/>

⁷¹ BT response to questions A1, A3-14, A6-A11 of the 7th s135 request

⁷² For the 2010 rating list there were transition rules in England that smoothed the effects for ratepayers who were subject either to large increases or decreases to their payments as a result of revaluation.

⁷³ See for example the discussion in Annex 26 of the June 2014 FAMR Statement.

⁷⁴ See for example the volume of unbundled lines that BT's published within its quarterly KPI's. See for example 2015/16 Q3 KPI report <http://www.btplc.com/Sharesandperformance/Quarterlyresults/2015-2016/Q3/Downloads/KPIs/q316KPIs.pdf>.

We have made further refinements to align the analysis to our modelling approach

- A29.75 In our analysis for the June 2015 LLCC Consultation we estimated the effect of volume changes using CVEs from the June 2015 LLCC Model. However, as there had been changes to LLCC components in previous years, for example, some components had been removed and replaced by new components, it meant we did not have CVEs for all components in all years. In those cases, we used an average CVE for the components which could not be matched to a component in the June 2015 LLCC Model.
- A29.76 We have updated our approach in this analysis to remove “missing CVEs”. We have calculated a CVE for each component (or more strictly the relevant super component) in each year. We have estimated the CVE for each super-component as the ratio of LRIC to FAC costs⁷⁵ for pay and non-pay costs together. This is the same approach as we adopt to calculate CVEs in the 2016 LLCC Model.
- A29.77 We have made one further adjustment to the CVEs to be consistent with the way we model costs in the 2016 LLCC Model. We have overwritten the LRIC/FAC ratio for accommodation costs to 21% for all network components used by TI services. The rationale for this is given in our description of the CVEs we have used in the model in Annex 32. This has had a significant impact on the results for TI services.
- A29.78 We have also slightly modified our estimates of relevant historical inflation. In the June 2015 LLCC Consultation, we assumed that inflation was the average CPI for the relevant year. In our updated analysis, we apply specific Ethernet and TI service inflation assumptions that reflect the cost mix for these two groups of services.⁷⁶ As we noted in the June 2015 LLCC Consultation we do not think that our inflation assumption has a critical impact on our results.

We have produced updated analysis

- A29.79 For each component we calculated the implied efficiency over 6 years using our 5 sets of pairwise comparisons, cost and volume data supplied by BT⁷⁷ 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’ volumes for that component and adding the results to produce total efficiency savings across TI and Ethernet services respectively.
- A29.80 We have sought to identify if the results are being unduly affected by changes in specific component costs in any year. We noted that efficiency for Ethernet services in 2014/15 was much lower due to large cost increases for some components, notably Ethernet Access Direct Fibre and Ethernet Backhaul Direct. The changes in the latter were due to an “input data” correction that “*did not meet the materiality threshold for the restatement of prior year comparatives*”.⁷⁸

⁷⁵ The LRIC and FAC data we have used has been taken from the Additional Financial Information (AFI) schedules BT provides to us annually, AFIs 1-4.

⁷⁶ See Annex 32 for more information on how we have derived inflation indices for this analysis. In particular Table A32.14 provides the values we have used in this analysis.

⁷⁷ BT response to 24th S135 request, question E1.

⁷⁸ BT response to 30th S135 request, questions E3. We have not made any adjustments for Ethernet Backhaul Direct.

A29.81 BT explained that the increase in Ethernet Access Direct costs was due to reallocations as a result of different volume growth for EAD, WES and BES and PPC circuits, which lead to Ethernet Access Direct Fibre costs increasing faster than volumes.⁷⁹ To reduce these reallocation issues for Ethernet services we have combined the results for the two major fibre components, Ethernet Access Direct Fibre and the Wholesale LAN Extension Services fibre.⁸⁰ We believe that analysing the movement across both components provides a better estimate of the efficiency for Ethernet services. It removes the effect of changes in the service mix within the Ethernet portfolio which is solely due to how components have been defined within BT's RFS.

A29.82 We also observed that estimates of efficiency based on the 2012/13 RFS pairwise comparison were very different to those in other years. BT made a number of significant changes to its attribution methodology in 2012/13, resulting in large cost increases in fixed access markets, with costs in leased line services generally decreasing. BT did not restate its results for many of these methodology changes. We therefore have not included the 2012/13 RFS pairwise comparison results in our estimates below. We have also not included the pairwise comparison results for years preceding this, given that in general we place lower weight on older data and these pairwise comparisons relate to periods up to 6 years ago. We note however, that very similar results arise across the five pairwise comparisons, excluding the 2012/13 RFS, to the estimates presented below.

A29.83 The results of our analysis are set out in Table A32.3 below. These are shown as average changes over the two "pairwise comparisons" since the 2012/13 RFS.

Table A29.3: Ofcom efficiency estimates of Operating Costs from analysis of Regulatory Cost Accounting data

	2012/13 to 2014/15 (Average pa over 3 years)
TI	[>] [5-10]% pa
Ethernet	[>] [5-10]% pa

Source: Ofcom analysis⁸¹

A29.84 Our analysis for the June 2015 LLCC Consultation produced quite large variations in the results for different years with negative values in some years (i.e. implying inefficiency). Our updated analysis produces more stable results especially when the 2012/13 RFS pairwise comparison is excluded. However, there remains some variation in the estimates for Ethernet services but less so than before.

A29.85 The above table suggests historical efficiency gains of [>] [5-10]% for TI services and [>] [5-10]% for Ethernet services. However our analysis could overstate efficiency for TI and understate it for Ethernet services. This is a corollary of BT's argument to explain the increases in Ethernet Access Direct component in 2014/15 noted above. Over the analysis period volumes have increased for Ethernet services and decreased for TI services. These volume changes will have affected relative attributions between the two groups of services. Reductions in TI service volumes will have led to fewer costs being allocated to TI components (potentially

⁷⁹ BT response to 30th S135 request, questions E2

⁸⁰ These two components are in any case made up of costs from the same plant groups.

⁸¹ These estimates reflect that there is no contribution to cost savings from cumulo rates costs.

leading to TI efficiency being overstated). Similarly, higher Ethernet volumes will have caused more costs to be allocated to Ethernet components (potentially leading to Ethernet efficiency being understated). This change in relative allocations between markets is not something we reflect in the 2016 LLCC Model. It is difficult to assess the scale of any overstatement or understatement. However we consider that the impact of reallocations between markets across TI and Ethernet services taken together should be small.

Analysis of historical and forecast BT management accounting information

June and November 2015 LLCC Consultations

A29.86 In both the June and November 2015 LLCC Consultations we discussed our analysis of historical and forecast BT management accounting information.

A29.87 In the June 2015 LLCC Consultation we explained that we had analysed PVEO⁸² analyses for three different divisions: BT Wholesale, Openreach and TSO as these three divisions accounted for most of the costs for leased line services. We refer to these three divisions here as Relevant BT divisions.

A29.88 We explained that we had encountered various data issues, notably:

- we did not have a consistent set of PVEOs for all Relevant BT divisions for all years;
- BT had not been able to provide us with PVEOs for all divisions that showed the movement in costs reported in one year to those reported in another year; and
- PVEOs for many of the cost transfer lines were limited in that inflation, volume and efficiency effects were small or zero.

A29.89 We combined the PVEO analyses from the Relevant BT divisions to provide our estimates of likely efficiency gains for leased line services as set out in Table A29.4 below. We noted that as PVEO analyses include both directly incurred costs and transfers from other divisions there was a risk that we might double count some cost savings.

Table A29.4: Ofcom estimates of efficiency gains for TI and Ethernet costs as set out in our June 2015 LLCC Consultation

Efficiency estimates pa	Historical : 2011/2 to 2013/14	Forecast: 2014/15 to 2015/16
Reflecting TI cost base	4.5%-8.5%	[>] [5-10% pa]
Reflecting Ethernet cost base	5.0%-7.5%	[>] [5-10% pa]

Source: Ofcom analysis of BT's historical PVEO analyses, Table A8.36, A8.37 from June 2015 LLCC Consultation

⁸² A PVEO analysis breaks down annual movements in costs into changes due to Price (inflation), Volume effects, Efficiency (or cost transformation) and Other.

- A29.90 We concluded that BT's historical and forecast PVEOs provided a good source of evidence about potential efficiency gains and that this evidence provided support for efficiency assumptions within a range of 4-7% per annum for TI costs and 5-7.5% per annum for Ethernet costs. There were however some issues that we proposed to consider before the publication of the statement.⁸³
- A29.91 In the November 2015 LLCC Consultation, we proposed a revised efficiency range for TI services as a result of new evidence presented by BT in relation to BT's historical and forecast management accounting information.
- A29.92 We noted that BT had highlighted that accommodation costs were a much larger proportion of TSO's operating costs that were attributed to TI services in 2014/15 than they were of TSO costs in general. Further, projected savings in 2014/15 on TSO's accommodation costs were lower than for other types of costs within TSO. Given these two issues we proposed revising our efficiency range for TI services from 4% to 7% per annum to 2% to 6% per annum. We made no change to our proposed range for Ethernet services.

Stakeholders' comments

- A29.93 We received comments from BT (supplemented by a report prepared by Deloitte) and Vodafone (supplemented by a report prepared by Frontier). BT provided a significant number of comments on our analysis within its responses to both the June and November 2015 LLCC Consultations within both its main submissions and various annexes. BT made comments on the methodology we had adopted and provided its own estimates of PVEO derived efficiency assumptions for Ethernet and TI services.
- A29.94 BT stated that it was not appropriate to base our analysis on its PVEO analyses as the forecast costs represented internal stretch targets. BT commented that Openreach had missed its 2014/15 targets by more than 25%".⁸⁴ It quoted from Deloitte's report that "the efficiencies element of the PVEO analysis is *'retrospectively calculated to match the ambitious profit targets set by BT group ... not based on a bottom-up analysis of what performance targets can be realistically achieved ... and determined by the need to meet ambitious financial performance targets'*".⁸⁵ Deloitte recognised that this information is only available for Openreach and not BT as a whole but it also noted that it did not find "*evidence to suggest that the conclusions from this analysis do not apply to other parts of the business'*".⁸⁶
- A29.95 Secondly, BT felt we had not fully reflected costs required to deliver future efficiency savings. BT said that a "*key factor to deliver future efficiency savings is ... 'leaver costs' associated with restructuring'*".⁸⁷ BT stated that "*adjusting for leaver costs and*

⁸³ We noted we would consider whether BT's estimates of volume effects were consistent with the way we estimate volume effects within the charge control model, whether TSO's results should be given a lower weight over time and whether BT's estimates of inflation used in our analysis were appropriate.

⁸⁴ BT response to the June 2015 LLCC Consultation, paragraph 227, page 47

⁸⁵ BT response to the June 2015 LLCC Consultation, paragraph 36 of Annex E

⁸⁶ BT response to the June 2015 LLCC Consultation, paragraph 37 of Annex E

⁸⁷ BT response to the November 2015 LLCC Consultation, paragraph 35, p.8-9

Career Transition Centre (CTC) payments reduces the average TSO efficiency down from 6.2% to 4.4%.^{88 89}

A29.96 BT also criticised our approach for not having made adjustments to the PVEOs it had submitted to us. BT referred to a review undertaken by Deloitte who identified four key issues that it believed would result in an upward bias when assessing potential efficiency gains. The four factors noted by Deloitte were:⁹⁰

- “double counting of economies of scale effects. Ofcom already takes into account effects of scale economies via the AVEs and CVEs being less than 1, and efficiencies are applied in addition to these. Deloitte found that cost savings due to economies of scale are captured in the “E” component rather than the “V” component of the PVEO analysis”;⁹¹
- “double counting of efficiencies across lines of business”. Deloitte believed that TSO should be excluded from the analysis, “since efficiencies associated within TSO should be reflected either in Openreach or BT Wholesale PVEO.”;
- “the ‘E’ component in PVEO does not only relate to efficiency but also includes elements of prices ... and accounting adjustments”; and
- “efficiency initiatives vary significantly across products, and applying an aggregate efficiency reduction across all network operations to specific products may overstate the potential for efficiencies”. Deloitte felt this was “particularly the case for 20C network and products, which include TI services”.

A29.97 BT highlighted certain exclusions it felt should be made to the BT Wholesale PVEO analyses. These related to “recovery of past under-billing for services” and the “external costs recovery from successful dispute resolutions with other operators”.⁹² BT also noted that “BT TSO PVEO has a limited contribution to any efficiency target for BTW”⁹³ and that “little of the ... [BTW] Cost Transformation programme relates to Leased Lines... nearly two-thirds of the “efficiencies” in 2013/2014 and planned savings in 2014/2015 in the BTW PVEO relate to voice, broadband and downstream MEAS / Ethernet products”.⁹⁴

A29.98 Lastly, BT noted in its response to the November 2015 LLCC Consultation that we should consider other more relevant internal BT data. “Within Openreach a new ‘Business Corporate Delivery’ division was created during 2014/15 and is the

⁸⁸ BT response to the November 2015 LLCC Consultation, paragraph 36. BT also notes in paragraph 31 of this response it has calculated the efficiencies net of the costs required to deliver these efficiency savings.

⁸⁹ BT made similar comments that calculations should take account of the additional costs incurred to deliver efficiency savings in other places in its various responses. See for example paragraph 46 of Annex E of BT’s response to the June consultation.

⁹⁰ The quotes are taken from Deloitte, BCMR 2015 – Efficiency estimation Review of Ofcom’s approach, August 2015, P.24-25 http://stakeholders.ofcom.org.uk/binaries/consultations/llcc-dark-fibre/responses/BT_Annex_G.pdf and BT response to the June 2015 LLCC Consultation, paragraph 46, p14. BT and Deloitte made a fifth point about capex efficiency that we deal with when we discuss capex efficiency.

⁹¹ BT made similar comments in paragraphs 233, 235 and 521 of its response to the June 2015 LLCC Consultation.

⁹² BT response to June 2015 LLCC Consultation, paragraph 512

⁹³ BT response to 1st s135 tranche 2, 29 August 2014

⁹⁴ Paragraph 522 of BT response to the November 2015 LLCC Consultation

nearest proxy for costs associated with business connectivity (Ethernet) services". BT said that its analysis showed that "for 2014/15 the expected efficiency savings from this division [were] between 3% and 4%".⁹⁵

A29.99 On the basis of the above comments, BT argued in its responses to the June and November 2015 LLCC Consultations that when appropriate revisions were made our evidence would not support the higher ends of the ranges we had proposed for both Ethernet and TI services.

A29.100 In relation to Ethernet services BT said:

- in response to the June 2015 LLCC Consultation that its analysis showed that when appropriate adjustments are made the analysis showed ranges of 3-5% on both a forecast and historical basis for Ethernet services;⁹⁶ and
- in response to the November 2015 LLCC Consultation that it had undertaken further analysis to address its concerns about our use of management accounting data. Reflecting leaver costs and CTC payments "*would have reduced the Ethernet efficiency estimate by 0.4% to 0.5%".⁹⁷ Reflecting some of the other issues it had raised, including Openreach performance against targets, BT claimed reduced the average efficiency for Openreach as a whole from 5.1% to 4%. Making similar adjustments to the TSO analysis led BT to conclude that "regardless of the weighting used for Openreach and BT TSO, expected Ethernet efficiency should be no more than 4.5% based on BT's internal management forecasts".⁹⁸*

A29.101 In relation to TI services BT said:

- in response to the June 2015 LLCC Consultation that its analysis showed an implied efficiency for BT Wholesale of 1-2% over the period 2014/15 to 2017/18 which was significantly lower than the range suggested by Ofcom;⁹⁹ and
- in response to the November 2015 LLCC Consultation BT welcomed our "*proposal to revise the efficiency range for TI services down to 2% to 6%".¹⁰⁰ on the basis of analysis undertaken on TSO costs.¹⁰¹ However, BT went on to reiterate some of the arguments it had made in response to the June 2015 LLCC Consultation, in particular that "the contribution of BT TSO savings to TI services is a fraction of what is expected of the division as a whole". As a result BT concluded that "we would expect TI efficiency to be close to 1.5%".¹⁰²*

A29.102 Frontier, in its report for Vodafone, noted that we had expressed concern that the PVEO framework may not adjust for volume based effects in the same way as the June 2015 LLCC Model and that we may have included "other" effects which are not in the model. Frontier's view was "*due to these discrepancies, efficiency estimates could be either overstated or understated. However no evidence has been then presented which indicates a systematic bias in the results which would*

⁹⁵ Paragraph 41, BT response to the November 2015 LLCC Consultation, page 10

⁹⁶ BT response to the June 2015 LLCC Consultation and Table 12 on page 49

⁹⁷ Paragraph 36, page 9, BT response to the November 2015 LLCC Consultation

⁹⁸ BT response to November 2015 LLCC Consultation, p.9, paragraph 39

⁹⁹ Paragraph 513 and Table 23, BT response to the June 2015 LLCC Consultation

¹⁰⁰ BT response to November 2015 LLCC, paragraph 28, p.7

¹⁰¹ BT response to November 2015 LLCC, paragraph 30, page7

¹⁰² BT response to November 2015 LLCC paragraph 32, page8

lead to either the top of the bottom of the range presented being the appropriate central estimate". Finally Frontier noted that our analysis of BT's PVEOs provided "no evidence of a reduction in efficiency gains in the future" and that as "5% is the bottom of the range for both backwards and forward looking estimates so the Ofcom assumptions appears to be below a reasonable central forecast".¹⁰³

Our conclusions

A29.103 For a number of years PVEO analyses have been used by BT in the management of its business and, therefore, provide views on BT's internal efficiency and cost transformation targets. These analyses break down annual movements in costs into changes due to Price (inflation), Volume effects, Efficiency (or cost transformation) and Other. A PVEO analysis therefore estimates efficiency after taking account of input price and volume changes. It covers all of a division's cash costs and includes operating costs, capital expenditure, costs incurred by the division itself and transfers in from other divisions.

A29.104 For this statement, we have updated our analysis of BT's PVEOs using more recent data. At a high level, our approach remains similar to the approach we set out in our June and November LLCC Consultations. We have taken management accounting information for the three Relevant BT divisions, calculated efficiency or cost saving rates in each division and then weighted the results together to produce both historical and future forecast efficiency improvements for Ethernet and TI services.

A29.105 However, we have refined our analysis in a number of areas, including considering how volumes have been reflected and how we have determined the appropriate weights for the different Relevant BT divisions for the different services.

It is appropriate to analyse management accounting data

A29.106 We have considered whether the forecasts within BT's PVEOs are "aspirational future efficiency targets" and therefore whether any estimates of efficiency based on these targets will be overstated. We note that BT claimed that Openreach missed the targets set out in its PVEOs by up to 25% in 2014/15.¹⁰⁴

A29.107 BT's analysis compared the budgeted efficiency movement against actual achieved efficiency. Any underachievement (or over-achievement) may not, however, have been due solely to efficiency but could also have been the results of errors in estimating the impact of prices and volume changes in the PVEOs.

A29.108 To overcome this, we have tried to compare forecast total costs to actual total costs.¹⁰⁵ In general we found that actual costs were similar to forecast, with only some small under- or over-achievement against cost targets, except for Openreach in 2014/15 (the year BT highlighted in its response). However, the main reason for this under-achievement against target appears to have been overspend on Capex.

¹⁰³ Frontier Economics, June 2015 LLCC Consultation Efficiency, August 2015, pages 5-6

¹⁰⁴ BT response to the November 2015 LLCC Consultation, page 9, paragraph 40

¹⁰⁵ We note that actual total costs within BT's PVEO are sometimes also estimates or forecast costs given when these PVEOs are constructed (i.e. before the end of the full year). Therefore, we have performed a reconciliation exercise comparing the actual total costs in the PVEOs to the actual costs as per the management accounts for the matching years which showed that differences are small and therefore the PVEO actual costs are likely to be reliable for the purposes of this analysis.

When capex costs were excluded total other costs were lower than forecast.¹⁰⁶ As we explain below we are not basing our analysis of capex efficiency on analysis of BT's PVEOS.

A29.109 We therefore consider that there is limited evidence to suggest that BT's divisional operating costs targets are not achievable, nor that they are not being achieved. Therefore it is reasonable to use our analysis of the forecast PVEOs for the purpose of our historical and forecast analysis of operating costs.

A29.110 Lastly as a cross check we have run our historical analyses using BT's actual management accounting data. The analyses produced very similar results. This again suggests that any over or understatement of efficiency introduced by using forecast PVEOs is likely to be limited.

We have included the costs incurred to achieve efficiency savings in our analysis

A29.111 BT questioned whether we have taken sufficient account of costs required to deliver future cost savings, such as leaver costs¹⁰⁷ in our analysis.

A29.112 We have included the change in costs incurred to achieve efficiency within the overall reduction or increase of costs for each division. We have not subtracted costs required to achieve efficiencies from costs savings as to do so would be inconsistent with how these costs are treated in the change control model. In the base year costs for the 2016 LLCC Model we include costs such as restructuring, leaver costs and property provisions. The charge control model forecasts how all costs will change over the change control period. If we had deducted payments such as leaver costs from the cost savings in any year then this would mean that BT received the benefit of these costs twice: once via the base year costs and again via the efficiency assumption.

A29.113 We note that our approach to these costs is consistent with the analysis we have undertaken of regulatory network cost component data that we describe above.¹⁰⁸ We analysed regulatory cost data that included attributions of restructuring and other costs to achieve efficiencies and then analysed changes in total operating costs which therefore included these costs.

We have eliminated double counting of efficiency savings across divisions

A29.114 In the June LLCC Consultation, we explained that we had combined the PVEO analyses from the Relevant BT divisions to give an indication of likely efficiency gains that better reflected the cost base for leased line services. We noted that because PVEO analyses include both directly incurred costs and transfers from other divisions there was a risk that we might double count some efficiencies and exclude potential efficiency improvements for other cost lines.

A29.115 We explained that to eliminate double counting one option would be to restrict the PVEO analysis to costs in the originating division and remove the corresponding

¹⁰⁶ Internal transfer costs were less than forecasts, non-transfer costs were slightly higher than forecast.

¹⁰⁷ Costs to achieve efficiencies largely consisted of restructuring costs. Those identified by BT in the PVEO analysis were leavers costs and career transition centre payments (BT response to November 2015 LLCC Consultation, page 9, paragraph 36).

¹⁰⁸ We note also that BT made a similar comment on leaver costs in its comments on our analysis of regulatory cost information.

transfers from the receiving division. However, we noted our ability to do this was limited by the data available. We rejected excluding all transfer charges (between all BT divisions, including the Relevant BT divisions) within the PVEOs because this might exclude some major legitimate cost items such as accommodation charges. We therefore excluded the transfer charges between the Relevant BT divisions which we were able to identify such as the charge for IT services from TSO to Openreach from the Openreach PVEO analysis.

A29.116 We disagree with BT (and Deloitte) that we should have excluded TSO costs in our analysis to resolve this double counting issue. Our analysis of regulatory accounting data has shown that a large proportion of both Ethernet and TI services costs are incurred within TSO. Firstly, it is not clear that cost savings made by TSO are passed through to other divisions within the PVEO analyses. Secondly, removing TSO from our analysis would mean that, even if they were passed through, only TSO cost savings transferred from TSO into Openreach and BTW would be captured in our analysis. We would therefore be excluding any TSO cost savings that relate to its services to several other BT divisions, including BT Business and Global Services, which may be relevant to Ethernet and TI services.

A29.117 For this statement, we have instead eliminated the issue of double counting of transfer charges by removing internal transfers that occur between the three Relevant BT divisions from the costs of the receiving division. Doing this ensures that no double counting occurs and the costs and associated cost savings are only recognised in the division where they are incurred.^{109 110}

We have taken steps to reflect differences in efficiencies between products

A29.118 In our November 2015 LLCC Consultation, we recognised that efficiencies may vary between products. In particular, we noted that accommodation costs were a much larger proportion of the TSO operating costs that were attributed to TI services in 2014/15 than they were of TSO costs in general. The difference for Ethernet services costs was much smaller.

A29.119 Projected savings in 2014/15 on TSO's accommodation costs were lower than the average for other types of costs within TSO. We considered that savings for TSO accommodation costs were likely to be relatively low given that they would be mainly associated with specialised accommodation (i.e. exchange buildings) and that we were not aware of major historical or future plans to vacate these buildings.

A29.120 This led us to propose that we should reflect differences in the mix of costs for different services within our analysis. We considered that doing so would reduce our June 2015 LLCC Consultation range for TI services but that the effect on our estimates of Ethernet efficiency would not be so marked. As we note above, BT

¹⁰⁹ BT provided, in its response to question A6 of the 24th s135 request, details of all the major historical "transfers out" and "transfers in" for the three Relevant BT divisions. These covered over 80% of the total transfers within each division. Differences between these and the transfers within the PVEOs and management accounts were generally small. For each Relevant BT division we removed the transfers in from other Relevant BT divisions from the PVEOs and management accounts. We did not make any adjustments for "transfers out" as these were not captured within the PVEO analyses

¹¹⁰ For PVEOs and management account forecasts after 2014/15 we only had information on total transfers but no breakdown of this by division. For these years we have used the split of transfers from 2014/15. This is the same approach we have adopted in other areas where forecast data is not available. We do not believe this is a critical assumption as transfer charges over 2013/14 and 2014/15 were broadly similar.

said our proposal went “*some way to address a number of points raised by in relation to the treatment of legacy services*”.¹¹¹ We received no suggestions from stakeholders for alternative ways to address this issue.

A29.121 In our updated analysis we have taken our proposal in relation to accommodation costs set out in the November 2015 LLCC Consultation and applied it in a consistent way to all types of costs across all Relevant BT divisions and markets. We received data from BT for 2013/14 and 2014/15¹¹² which showed how Openreach’s, TSO’s, BT Wholesale’s and all other divisions’ pay and non-pay costs by sector had been allocated to LLCC Markets, all other regulated markets and all unregulated markets.¹¹³ We then matched this data to the management accounting and PVEO data we had received for the three Relevant BT divisions.¹¹⁴ This allowed us to weight each line within each Relevant BT divisions’ PVEO in each year so that the mix of costs better reflected the mix of costs for Ethernet and TI services.¹¹⁵ As a result we have taken steps to address differences in cost savings between products within our analysis of BT’s management accounting data.

We have not included consideration of Openreach’s new Business Corporate Delivery (BCD) division

A29.122 The costs of Openreach’s BCD division are likely to only be appropriate when considering efficiency for Ethernet services and not TI services. BT stated that “*Ethernet is the main product supported by this unit however other areas such as Customer Premise Equipment/Switches, Power engineers and other provisioning (amongst other areas are delivered by this unit.*”¹¹⁶

A29.123 We currently have very little data for the BCD division. We only have cost data for 2014/15 and a projected view of 2015/16. Any analysis of the BCD division for the purpose of setting efficiency targets would also need to include TSO costs given TSO costs account for a fair share of Ethernet services’ costs. We note that the cost data we have for the BCD division included relatively low levels of transfer charges which implies the appropriate amount of TSO costs could not have been included.

A29.124 We have however compared the results of analysing the PVEO for this new division¹¹⁷ with those from applying our revised methodology for Ethernet services, which we describe below (reflecting our revised approach to inflation, volume changes and weighting). The estimated operating cost efficiencies are very similar. For 2014/15 we observe operating cost efficiencies of [3%] for the BCD division as opposed to [3%] for Ethernet services.¹¹⁸

¹¹¹ BT response to November 2015 LLCC, page 7, paragraph 28

¹¹² BT was not able to provide this data to the same degree of rigour for prior years although it did provide some data for 2012/13.

¹¹³ BT’s corrected response to the 24th S135, question D9.

¹¹⁴ See paragraph A29.144 which explains the reconciliation process.

¹¹⁵ The weights we have applied for this stage in the analysis in years prior to 2013/14 reflect the weights for 2013/14. The weights we have applied in years after 2014/15 reflect the weights we calculated for 2014/15.

¹¹⁶ BT response to the 24th S135, question D9

¹¹⁷ BT response to the 24th S135 question D9.

¹¹⁸ Our analysis of BCD division PVEO was fairly rudimentary. It used BT’s inflation assumptions and its estimates of volume effects which reflected [3%] volume growth. It was unclear how or if any transfers from TSO had been included. Had we been able to perform a more rigorous analysis that

A29.125 Given the above mentioned limitations we have not specifically included the costs of the new BCD division within our analysis.

We have calculated volume effects that are consistent with our 2016 LLCC Model

A29.126 BT's and Deloitte's arguments in relation to double counting of economies of scale have led us to consider whether the "V" component in the PVEOs is calculated in a way that is consistent with how we reflect volume changes in the charge control model. We have therefore updated our analysis and calculated the effects of volume changes in a way that is more consistent with our modelling approach.¹¹⁹ Effectively, we have overwritten the "V" effects within BT's PVEO analyses with our own estimates of those effects. Given the interaction between the different assumptions, and that efficiency is calculated as any remaining differences in costs after taking account of inflation and changes in volumes, we consider that it is important that the "V" in the PVEOs is consistent with our modelling approach.

A29.127 Within the 2016 LLCC Model, we capture the effect of volume changes on operating costs by applying a cost volume elasticity (CVE) to the growth in component volumes, which in turn reflects growth in products and service volumes.

A29.128 Our analysis of BT management accounting data considers costs in the three Relevant BT divisions. Costs are not broken down by product or service. Within our analysis of BT's management accounting data we therefore estimate the effects of changes in volumes by applying a CVE to an estimate of the volume growth for each Relevant BT division in each year. This divisional growth rate needs to reflect volume growth across all the products and services that activities within that division support.

A29.129 Due to data availability we have used different approaches to estimate these divisional volume growth rates:

- For **Openreach**, starting from the Openreach Income Statements published within BT's RFS,¹²⁰ we have weighted together average volume growth in each market by prior year revenues. We have calculated volume growth in each RFS regulated market in each year by analysing revenue growth and removing the impact of price changes. We did this by comparing revenues in the prior year with current year volumes multiplied by prior year prices. We have also undertaken some further analysis to reflect the impact of growth in VULA services, which has been quite considerable over the past few years.¹²¹ Finally, we have undertaken

reflected TSO costs and more appropriate volume effects we believe this would have resulted in higher estimates of operating cost efficiency based on the results from this division.

¹¹⁹ BT provided adjusted PVEOs which reflected revised estimates of volume effects. However the volume metrics and adjustments BT made were not consistent with the way we treat volume changes in the charge control model. We have therefore not used BT's updated PVEOs in our analysis.

¹²⁰ See for example page 116 of BT's 2015 Revised RFS. These schedules show Openreach revenues for various regulated markets. Other schedules within BT's RFS provide further splits of market revenues by product and service for both current and prior years together with information on average prices and volumes.

¹²¹ Prior to BT's 2014/15 RFS revenues and costs for VULA services were reported within Wholesale Residual Markets. In the 2014/15 RFS these costs and revenues were reported within the WLA market but not separately identified. To assess how VULA services contribute to Openreach volume growth we have assumed that Other WLA service revenues reported in the 2014/15 RFS for 2013/14 and 2014/15 are predominantly VULA services [3X] and used this revenue growth as a proxy for volume growth in 2014/15. BT's statistics on fibre volumes as reported within BT's KPIs suggests this

two further calculations as a cross check on these estimates.¹²² Whilst there were some differences our estimates of volume growth were broadly consistent. They all estimated small positive growth for Openreach over the last three to four years with similar annual average growth rates.

- For **BT Wholesale** we have estimated volume growth from its published revenues¹²³ and again removed the effect of price increases by deflating these by a price index.¹²⁴ As for Openreach we have cross checked our estimates.¹²⁵ For the one year for which we had a comparison the cross check calculation produced almost identical volume growth.
- Lastly for **TSO** we have estimated volume growth using information on TSO transfer charges to other divisions.¹²⁶ We calculated an overall volume growth rate by weighting volume growth rates for each division by its transfer charge.¹²⁷

A29.130 Table A29.5 below shows our calculated volume growth rates for the three relevant BT divisions.¹²⁸

Table A29.5: Ofcom estimates of historical volume growth for selected BT divisions

Market	2012/13	2013/14	2014/15
Openreach	[X]	[X]	[X]
BT Wholesale	[X]	[X]	[X]

may understate growth in 2014/15. Before 2014/15 we have estimated VULA services volume growth from data on fibre connections and used this to infer VULA service revenues in prior years. Finally we have removed these estimated VULA service revenues from “Other Openreach Markets and Activities” and assumed revenue growth is a reasonable proxy for volume growth for the remaining non-VULA services.

¹²² Firstly we analysed the change in Openreach reported revenues (see for example <http://www.btplc.com/Sharesandperformance/Quarterlyresults/2014-2015/Q4/Downloads/KPIs/q415-KPIs.pdf>) and estimated volume growth by removing the effect of price increases by deflating these by a price index (Business Telecom Services producer Price Index published by ONS). Secondly we analysed internal product transfer costs made by Openreach to other BT divisions (BT response to the 24th S135 question A5). We weighted our estimated volume growths for these products from our analysis of RFS market data by prior year transfer charges.

¹²³ See for example <http://www.btplc.com/Sharesandperformance/Quarterlyresults/2014-2015/Q4/Downloads/KPIs/q415-KPIs.pdf>

¹²⁴ We have used The Business Telecom Services producer Price Index published by ONS. This is series K8U1. See http://www.ons.gov.uk/ons/dcp171778_425383.pdf, page 34

¹²⁵ We have also calculated volume growth for BT Wholesale using information on internal transfer charges provided in BT response to 24th s135, question A5. We analysed the change in internal transfer charges from Openreach into BT Wholesale for different groups of products and removed the impact of price changes.

¹²⁶ BT response to the 24th s135, question A5. TSO sends transfer charges to most BT divisions including Global Services, BT Retail and BT Consumer

¹²⁷ The growth rates we used for BT Wholesale and Openreach are those that we describe above. We calculated growth rates for BT Retail, BT Consumer, BT Business and Global Services using the approach we have used for BT Wholesale. We estimated volume growth in these divisions from the change in published revenues deflated by a price index (using BT KPI reports e.g.

<http://www.btplc.com/Sharesandperformance/Quarterlyresults/2014-2015/Q4/Downloads/KPIs/q415-KPIs.pdf>). We used the Service Producer Prices Index, series K8U1, to deflate BT Business and Global Services revenues and CPI Index 08.2, Telephone and Telefax Equipment and Services, series D7EM, to deflate BT Retail and BT Consumer revenues.

¹²⁸ We have used the 2014/15 forecasts in years post 2014/15 and the 2012/13 estimates in 2011/12. That is consistent with the approach we have adopted in other areas where we do not have historical or forecast data.

TSO	[X]	[X]	[X]
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Source: Ofcom analysis on BT data as described in section above.

A29.131 Lastly we have applied a standard **CVE** of [X] across all cost categories and all divisions in all years. We calculated this CVE from LRIC and FAC data for operating costs (excluding depreciation) for all network components in each of 2012/13, 2013/14 and 2014/15.^{129 130}

We have updated our approach to inflation

A29.132 Prompted by BT's comments we have reviewed our approach to inflation by considering whether the "P" assumptions that BT made within its PVEOs are (and should be) consistent with the cost inflation assumptions we make in the 2016 LLCC Model.

A29.133 Our analysis shows that these two sets of inflation assumptions are different. It is important that we adopt a consistent approach to inflation in the analysis of efficiency and in our modelling approach given the interaction between our inflation and efficiency assumptions. But it is also important as efficiency is calculated as any remaining differences in costs after taking account of inflation and changes in volumes.

A29.134 We have therefore considered overwriting the "P" effects in the PVEO analyses to be consistent with our modelling assumptions, in the same way that we have overwritten the "V" effects. First though, we have considered whether doing so would be inconsistent with the way the PVEO analyses have been prepared. For example, if divisional cost forecasts are prepared for accommodation transfers, assuming no inflation, then it would be wrong to overwrite any zero inflation within the PVEOs with our own estimate of a more relevant inflation estimate for these costs.

A29.135 If, however, we were analysing changes in annually reported management account transfers then it would be appropriate to apply the relevant inflation index as these transfers should reflect annual changes in, for example, rental prices. In all cases where we have PVEOs and management accounting information that report the movement in actual to actual costs, we therefore consider that it is appropriate to overwrite BT's "P" effects with our own price inflation estimates.

A29.136 In addition, when analysing the movement in actual to forecast costs, we note, firstly, that most directly incurred costs within the PVEOs include estimates of price effects. Further, for some directly incurred costs, some PVEOs contain cost savings due to the effect of contract renegotiation. Any such price reductions need to be reflected either within our cost inflation analysis or as part of efficiency savings. As we have decided not to include any such savings within our cost inflation

¹²⁹ LRIC and FAC data came from the Additional Financial Information schedules that BT provides to us each year. LRIC data was taken from the AFI1 and AFI2 schedules, the comparable FAC data was taken from the AFI3 and AFI4 schedules. The overall LRIC/FAC ratios were very similar in each of the three years we analysed.

¹³⁰ The constant CVE assumption is a simplification but one we consider is not inappropriate given the range of costs that the CVE is being applied to and the low volume growths we have calculated. We do not consider it a critical assumption. We also calculated divisional specific CVEs that reflected the cost mix within each Relevant BT division. Applying these had minimal impact on our efficiency estimates for Ethernet and TI services.

assumptions we believe it is appropriate to include these as part of our efficiency estimates. For all costs directly incurred by the Relevant BT division, we have therefore overwritten the inflation assumptions with those that are consistent with our own analysis.

A29.137 Finally, we also consider that it is correct, in general, to overwrite BT's inflation assumptions for the remaining transfer charges, with the exception of those transfer charges that had a zero price effect and that BT described as "fixed" (as opposed to variable through the year).¹³¹ We have assumed that forecasts for these "fixed" cost transfers have been prepared assuming no inflation and so have not overwritten BT's inflation assumptions.

A29.138 We therefore have overwritten the majority of the "P" effects in the PVEOs with estimates that are consistent with our modelling assumptions. We describe our analysis of historical and future price inflation in Annex 32.¹³²

We have updated the PVEO data where available and made further adjustments

A29.139 As for the June 2015 LLCC Consultation, we have analysed historical and future forecast PVEOs for the Relevant BT Divisions over the period 2011/12 to 2015/16, considering updated forecasts where available.^{133 134} We have analysed the movement in costs from year to year removing the effects of inflation and changes in volumes.

A29.140 BT divisions, with the exception of Openreach, no longer prepare PVEO analyses. However they continue to prepare cost forecasts for their Business Unit Reviews. We have analysed these cost forecasts for the Relevant BT divisions for 2015/16 and 2016/17¹³⁵ and have also considered BT's medium term forecasts out to 2018/19 for Openreach and BT Wholesale.

A29.141 In addition to removing the transfer charges between the three Relevant BT divisions we have also, as for the June 2015 LLCC Consultation, made a number of further adjustments to both the original PVEO analyses and Divisional Unit Reviews cost forecasts. In particular, we have:

- removed cumulo rates costs¹³⁶ due to uncertainty over these costs following the next rating revaluation in 2017/18.¹³⁷ For PVEOs that analyse actual to forecast costs the amount removed has been kept the same over the year. This is to reflect BT's comment that [X<]¹³⁸ As in our analysis of BT regulatory accounting data this means that we assume there are no cost savings to be made on BT's cumulo rates costs in the future;

¹³¹ BT response to the 24th S135, question A6.

¹³² Annex 32 has more information on how we have derived historical and forecast inflation indices. In particular Table A32.15 provides values relevant for our historical analysis.

¹³³ BT response to the 24th S135 notice, question D2

¹³⁴ We received updated PVEO analyses for Openreach out to 2018/19. Whereas for BT Wholesale and BT TSO the latest forecast PVEO forecast information is up to 2015/16 and was prepared in September 2014.

¹³⁵ BT response to 30th s135 question C1 and C2 and BT response to follow up questions to questions C1 and C2.

¹³⁶ BT response to the 24th S135 notice, question A5.

¹³⁷ We discuss the uncertainty over these cumulo rates costs in our consideration of BT's regulatory accounting data above.

¹³⁸ BT response to the 24th S135 notice, question A6.

- removed POLOs (Payments to other Licenced Operators) as these costs are not relevant to leased line services;
- removed some costs from BT Wholesale's PVEO in 2014/15 that it had identified represented "*recovery of past under-billing for services*".¹³⁹ We accept that these movements are more associated with revenues and not costs; and
- generated the Openreach pay/non-pay split of costs using information from Openreach's management accounts.¹⁴⁰ Openreach does not distinguish between pay and non-pay operating costs in a number of the PVEOs provided. We require this split in order to be able to weight costs together to reflect the relevant cost mix for Ethernet and TI services.

A29.142 We consider that insurance costs should also be removed from the PVEO analyses [X]. However, we did not have sufficiently disaggregated data to remove these costs from the data we use to weight the PVEO analyses. We note that by not excluding these costs we may have potentially understated the cost savings to the extent that BT's final insurance costs in the year were less than those forecast within the PVEOs.

We have updated the data we have used to weight the divisional costs savings together

A29.143 For this statement we have obtained updated information from BT for 2013/14 and 2014/15¹⁴¹ that shows how costs for Openreach, BT TSO, BT Wholesale and all other divisions are allocated to LLCC Markets, split down by cost sector.¹⁴²

A29.144 Building on the approach we adopted for the June 2015 LLCC Consultation, we have made a number of adjustments to make this "weighting" data consistent with the cost data that we have used to assess efficiency for the Relevant BT divisions. In particular we have:¹⁴³

- aligned the RFS weighting data with the management accounts data. This process largely consists of reversing out internal transfers that have been captured in the management accounting data but not the RFS data or vice versa;
- removed internal transfers between the three Relevant BT divisions in the same way that we adjusted the PVEO and divisional cost forecast data;
- excluded cumulo rates costs

¹³⁹ See page 97, paragraph 512 of BT's response to the June 2015 LLCC Consultation.

¹⁴⁰ BT response to 24th S135 question A1-A3.

¹⁴¹ BT revised response to the 30th S135 notice, response to question A1. We also requested information for 2012/13 but were unable to use this within our final analysis as we were not able to construct a satisfactory reconciliation to the PVEO and management accounting formation we had received.

¹⁴² With energy separately identified from the accommodation cost sector and cumulo separately identified from the Plant support cost sector.

¹⁴³ As in our regulatory cost analysis we have not made any changes to this weighting data to reflect the allocation changes we have made to our base year data for this control. Such an exercise would have been complex and would have run the risk of introducing errors into our analysis.

- excluded costs incurred outside Openreach, BT Wholesale and TSO;¹⁴⁴ and
- excluded depreciation or indeed any capital costs as our analysis now focuses on operating costs alone.¹⁴⁵

A29.145 Table A29.6 below shows the shares of leased line costs by division¹⁴⁶ in 2013/14 and 2014/15 taking into account the above adjustments. We have used these cost shares to weight the divisional analyses to estimate efficiency improvements for Ethernet and TI services.

Table A29.6: Ethernet and TI operating costs by division for 2013/14 and 2014/15

Market	Year	Openreach	BT Wholesale	TSO
Ethernet Opex	2013/14	[X] [50-80]%	[X] [0-5]%	[X] [20-50]%
	2014/15	[X] [50-80]%	[X] [0-5]%	[X] [20-50]%
TI Opex	2013/14	[X] [20-40]%	[X] [0-10]%	[X] [50-80]%
	2014/15	[X] [20-40]%	[X] [0-10]%	[X] [50-80]%

Source: Ofcom analysis of revised data provided by BT in response to the 30th s135 notice in response to question A1.

A29.146 Table A29.6 shows that 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 these charge controls.

A29.147 The addition of the extra year's data (since the June 2015 LLCC Consultation) also shows that whilst the divisional breakdown of Ethernet costs has remained fairly constant, TSO's share of TI operating costs increased slightly in 2014/15. We apply the 2014/15 shares in our analysis of all data post 2014/15.

A29.148 We have used the resulting adjusted weighting data for two purposes in our analysis of BT management accounting information. Firstly, as we did in the June 2015 LLCC Consultation we have weighted the Relevant Divisional PVEOs together in proportion to total operating costs in each division. Secondly, we have re-weighted the cost lines within each Relevant Division's PVEO so that the mix of costs reflects that used to supply Ethernet and TI services.¹⁴⁷

Summary of our revised approach to analysis of BT Management Accounting data

A29.149 The approach we have used to combine divisional PVEOs and produce estimates of efficiency for Ethernet and TI services is now more complex than it was in the June 2015 LLCC Consultation. Not only does it build on the proposal within our

¹⁴⁴ This is the approach we took for the June 2015 LLCC Consultation. These costs are a small proportion of costs for Ethernet and TI services and are mostly costs associated with BT Group Functions (BT response to 1st s135 notice, question F3). In addition, Group Function transfers are included in the internal transfers in the Openreach, BT Wholesale and TSO divisional PVEOs that we have not excluded.

¹⁴⁵ In the June 2015 LLCC Consultation we used depreciation as a proxy for the relevant weight to give each division's capital expenditure.

¹⁴⁶ Shares calculated so that the three relevant divisions total to 100% i.e. all other divisions contributing to BCMR costs are not factored into this weighting.

¹⁴⁷ We have discussed this when considering BT's argument that efficiency varies by product above

November 2015 LLCC Consultation but we have also developed it to address stakeholders' comments, notably BT's.

A29.150 The approach we have therefore used adopts the follow steps:

- Obtain input data: BT management accounting data for each Relevant BT division and RFS data that shows how LLCC costs split by BT division;
- Undertake a reconciliation exercise to ensure that input data for Relevant BT divisions are comparable;
- Remove transfer charges into each Relevant BT division from other Relevant BT Divisions in both sets of data;
- Adjust Ethernet and TI management accounting data for each Relevant BT division such that they reflect the cost mix for those services consistent with the adjusted RFS data;
- Overwrite BT's estimates of price ("P") and volumes ("V") effects with assumptions that are consistent with those we adopt in the 2016 LLCC Model; and
- Combine the adjusted Relevant BT divisions results to produce overall PVEO analyses for Ethernet and TI services using the final adjusted RFS data.

Estimates of divisional efficiency from BT management accounting data

A29.151 Table A29.7 shows the efficiency estimates of divisional efficiency we have calculated from following the above process. We show the results separately for average historical efficiency over the period 2011/12 to 2014/15 calculated from BT's PVEO analyses and forecast efficiency over the period 2014/15 to 2016/17. As TSO was only established in 2012/13 we have therefore also shown historical estimates over the period 2012/13 to 2014/15.¹⁴⁸

Table A29.7: Ofcom estimates of efficiency gains on operating costs

BT division	Average gain 2010/11-2014/15	Average gain 2012/13-2014/15	Average gain 2014/15-2016/17
Openreach	[X]	[X]	[X]
BT Wholesale	[X]	[X]	[X]
TSO	[X]	[X]	[X]

Source: Ofcom analysis of BT PVEO data supplied in response to the 6th and 24th s135 notice

¹⁴⁸ We have not used BT's cost forecasts after 2016/17 to inform our analysis. In both the June 2015 LLCC Consultation and the 2014 FAMR Statement we observed a step change in cost savings predicted in shorter term budget estimates and those in medium term planning data over the longer term (see paragraph A8.199 of the June 2015 LLCC Consultation). BT's latest forecasts showed cost savings up to 2016/17 but relatively few after that. Our decision not to use these medium term forecasts is consistent with our approach in other charge controls and with BT's public comments about future cost savings (see below).

Our analysis suggests that for TI services efficiency was within the range of 3.2-5.6% pa

A29.152 Table A29.8 shows historical and future forecast efficiency estimates for TI services' operating costs based on our analysis of BT's management accounting data and Business Unit Review forecasts. These reflect the results of weighting the annual estimates of historical TI specific divisional efficiency by the divisional shares given in Table A29.7.

Table A29.8: Historical and future forecast estimates of efficiency gains for TI services' operating costs¹⁴⁹

	2010/11-2014/15	2012/13-2014/15	2014/15-2016/17
Range	[<]	[<]	[<]
Average Gain	[<] [0-5]% pa	[<] [0-5]% pa	[<] [5-10]% pa

Source: Ofcom analysis of BT PVEO data supplied in response to the 6th and 24th s135 notice and Ofcom analysis of BT Business Unit Review data supplied in response to the 30th s135 notice Question C1 & C2

Our analysis suggests that for Ethernet services efficiency was within the range of 3.8-6.4% pa

A29.153 Table A29.9 shows historical and future forecast efficiency estimates for Ethernet services' operating costs respectively based on our analysis of BT's management accounting data and Business Unit Review forecasts. These reflect the results of weighting the annual estimates of forecast Ethernet specific divisional efficiency by the divisional shares given in Table A29.7.

Table A29.9: Historical and future forecast estimates of efficiency gains for Ethernet services' operating costs¹⁵⁰

	2010/11-2014/15	2012/13-2014/15	2014/15-2016/17
Range	[<]	[<]	[<]
Average Gain	[<] [5-10]% pa	[<] [5-10]% pa	[<] [5-10]% pa

Source: Ofcom analysis of BT PVEO data supplied in response to the 6th and 24th s135 notice and Ofcom analysis of BT Business Unit Review data supplied in response to the 30th s135 notice Question C1 & C2

Assessment of information originating from outside BT

We have considered a range of benchmarking studies

June 2015 LLCC Consultation

A29.154 In the June 2015 LLCC Consultation, we considered that benchmarking data could provide a potentially informative source of evidence. The only benchmarking study we considered was one undertaken by AT Kearney for BT. We undertook further analysis of this using additional information from BT to assess the relevance of the study for leased line services. We had concerns that the data could be viewed as

¹⁴⁹ These estimates reflect that there is no contribution to cost savings from cumulo rates costs.

¹⁵⁰ These estimates reflect that there is no contribution to cost savings from cumulo rates costs.

historical and that it could only be used to estimate catch-up efficiency. We concluded that it provided some evidence that BT was not at the frontier and that there were gaps even when compared to [3<] that BT could close over the period of the charge control. We placed a low weight on this evidence when forming our overall efficiency assumptions and used it to inform our lower bound.

Stakeholders' comments

A29.155 We only received comments from BT about our assessment of benchmarking information and in general about our consideration of information originating from outside BT. This was a large part of BT's responses on efficiency to our June and November 2015 LLCC Consultations. We summarise BT's key points below.

A29.156 BT made relatively little reference to the analysis we had undertaken of the AT Kearney study though it asked "*why [Ofcom has not explained] this report was considered of limited use in the WBA market review, but considers it relevant in the LLCC Consultation*".¹⁵¹

A29.157 BT's main argument was that we had not considered "*a number of alternative sources of information with regards to total factor productivity for the telecoms sectors, across the regulated sectors, and for the UK economy as a whole*".¹⁵² Further that "*Ofcom has not considered the existence of a wider range of alternative sources for Total Factor Productivity ("TFP") growth estimates in the LLCC Consultation even though Ofcom equates the efficiency assumption in its model to TFP*".¹⁵³ BT considered that Ofcom's "*assumption of a 4-7% efficiency range for Ethernet services in our June 2015 LLCC Consultation did not appear to be in line with the alternative evidence available*".¹⁵⁴ It made similar remarks when commenting on our efficiency assumption for TI services.¹⁵⁵

A29.158 To support its arguments BT referred to various alternative sources of information it believed Ofcom should have considered. Firstly, BT referred to the latest work undertaken by Deloitte on its behalf.¹⁵⁶ Deloitte had assessed the average TFP growth for BT and eight European fixed line operators between 2004 and 2014. Deloitte's results show "*average TFP growth over the last decade of around 0.5% to 1.25%*"¹⁵⁷ and that "*its results indicated that 'across fixed line, incumbent European telecommunications operators, productivity improvements have been small'*".¹⁵⁸

A29.159 BT went on to note that Deloitte's findings were consistent "with those obtained by other studies that show that TFP growth has been estimated between 0.5 and 1.25%".¹⁵⁹ Its response included a table that summarised TFP results obtained by

¹⁵¹ BT response to the June 2015 LLCC Consultation – Annex E, August 2015, paragraph 19, page 6

¹⁵² BT response to the June 2015 LLCC Consultation – Annex E, August 2015, paragraph 7, page 2

¹⁵³ BT response to the June 2015 LLCC Consultation – Annex E, August 2015, paragraph 12, page 3

¹⁵⁴ BT response to the June 2015 LLCC Consultation – Main Response, August 2015, paragraph 229, page 48

¹⁵⁵ BT response to the June 2015 LLCC Consultation – Main Response, August 2015, paragraph 519, page 99

¹⁵⁶ Deloitte Report, Annex G to BT response to the June 2015 LLCC consultation

¹⁵⁷ BT response to the June 2015 LLCC Consultation – Annex E, August 2015, paragraph 16, page 4

¹⁵⁸ BT response to the June 2015 LLCC Consultation – Annex E, August 2015, paragraph 16, page 4

¹⁵⁹ BT response to the June 2015 LLCC Consultation – Annex E, August 2015, paragraph 16, page 4

different studies, including studies undertaken by Deloitte over the period 2009 to 2013, KPMG studies in 2008 and NERA studies from 2005 and 2008.¹⁶⁰

A29.160 BT also referred to a report it had commissioned from FTI on efficiency that “shows that other regulators consider TFP as part of their efficiency analysis’ as it provides a useful cross-check on other analysis”.¹⁶¹ BT provided a table that summarised “a number of TFP estimates for the telecommunications industry as well as for the UK as a whole”.¹⁶² This referred to studies undertaken by the Office of National Statistics (ONS) over the period 2011 to 2015 along with older TFP studies undertaken from the UN Productivity Data base and by Reckon.¹⁶³

A29.161 BT noted that “the results consistently show that the Information, Communications and Technology (“ICT”) sector is by far the largest contributor to overall UK economy productivity growth, with a cluster of estimates around 2% to 4% (with the 7% experimental study by the ONS setting the upper end of the range). The higher rates of growth observed, particularly for the mobile carriers, are consistent with the observation that massive regulatory reforms have been dominated by mobile communications sector reform, which have contributed significantly to firms’ efficiency and TFP growth”.¹⁶⁴

A29.162 Lastly BT made further reference to FTI’s report which considered efficiency assumptions used by other regulators. It included a table that summarised estimates of frontier shift made by various UK regulators.¹⁶⁵ BT noted that FTI “considers that a qualitative analysis suggests that the evidence presented is a relevant consideration, and that there is scope for comparison with the services considered in the LLCC Consultation.”¹⁶⁶

A29.163 In its comments on our Ethernet efficiency assumption BT summarised its comments on TFP studies by stating that “The TFP analysis obtained by different studies of the telecoms sector show that a reasonable frontier shift assumption would be between 0.5% and 3.0%. This has been consistently estimated by different parties over different time periods and using different sets of comparators. When set against sector-wide and economy-wide TFP estimates we find further evidence of long term trends of 2% to 4% for the ICT sector as a whole, a sector that has contributed the most to the TFP growth in the overall economy. Compared to the frontier shift assumptions used by other sector regulators in the UK we note that the range assumed tends to be around 0.25% to 3%, with a general consensus of estimates around 1%, and applied mainly to operating costs only, but sometimes also to capital expenditure”.¹⁶⁷

¹⁶⁰ BT response to the June 2015 LLCC Consultation – Annex E, August 2015, Table 1, page 5

¹⁶¹ BT response to the June 2015 LLCC Consultation – Annex E, August 2015, page 6, paragraph 22

¹⁶² BT response to the June 2015 LLCC Consultation – Annex E, August 2015, paragraph 22, page 6

¹⁶³ BT response to the June 2015 LLCC Consultation – Annex E, August 2015, Table 2, page 7

¹⁶⁴ BT response to the June 2015 LLCC Consultation – Annex E, August 2015, paragraph 23, page 7

¹⁶⁵ BT response to the June 2015 LLCC Consultation – Annex E, August 2015, Table 3, page 9

¹⁶⁶ BT response to the June 2015 LLCC Consultation – Annex E, August 2015, paragraph 26, page 9

¹⁶⁷ BT response to the June 2015 LLCC Consultation – Main Response, August 2015, Paragraphs 230 and 231, page 48

A29.164 BT also considered that *“in terms of catch up and BT’s relative position compared to a benchmark company, BT’s submissions to Ofcom show that there has been a closing of the gap between BT and the best practice frontier”*.¹⁶⁸

Our conclusions

A29.165 We believe that benchmarking data and indeed other data originating from outside BT can provide a potentially informative source of evidence. One of the advantages of benchmarking data which assesses BT’s performance against other companies, is that it complements most of our other evidence which assesses historical and forecast data for BT only. However, there can be issues with interpreting this type of benchmarking data and other non-BT related benchmarking studies. 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.

A29.166 We said in our June 2015 LLCC Consultation that, as our efficiency measure is independent of input price changes and volume effects and considers the effects of delivering cost savings across labour, non-labour costs and capital expenditure, it can be thought of as a measure of BT’s total factor productivity. However, the relevance of evidence from total factor productivity studies (or indeed benchmarking studies or any studies based on external data) needs to be considered in the context of their consistency with how we apply the efficiency assumption in our charge control.¹⁶⁹

A29.167 We apply our efficiency assumption to cash costs, capital expenditure and operating costs excluding depreciation. So studies that might compare or consider narrower ranges of costs (for example, just pay costs) or wider ranges of capital costs (for example, including depreciation or measures of companies’ asset bases) will be less relevant.

A29.168 We also need to consider the relevance of evidence from external studies in the light of other evidence that we have obtained. If there are large differences between the different sources then we will tend to have more confidence in the evidence that is more consistent with our modelling approach and/or has direct relevance for the services we are considering within BT.

A29.169 In the rest of this section we consider evidence from various benchmarking and external studies. We first consider benchmarking studies that BT has provided to us. We then review the alternative sources of evidence.

We have considered benchmarking studies provided by BT

A29.170 In the June 2015 LLCC Consultation we explained that we had asked BT to provide all relevant benchmarking studies it held, including any updates to studies it had previously submitted as part of the June 2014 FAMR Statement and June 2014 WBA Statement. BT provided a study that had been undertaken by AT Kearney for BT. We set out our consideration of this study below.

¹⁶⁸ BT response to the June 2015 LLCC Consultation – Main Response, August 2015, Paragraph 232, page 48. BT made similar comments with reference to our efficiency assumption for TI services in paragraph 527 of the same response.

¹⁶⁹ We discuss this point further within “Our approach to defining and considering efficiency gains”. See paragraph A29.27 above.

A29.171 Following the June 2015 LLCC Consultation we again asked BT to provide us with information on any other benchmarking exercises that it had commissioned which reviewed the relative or absolute efficiency or scope for cost savings or costs transformation of BT Group or any of the three Relevant BT divisions. BT provided us with details of two further studies.¹⁷⁰

A29.172 The first was a Deloitte study that it had included within its response to the June 2015 LLCC Consultation. The second was a benchmarking study into IT costs presented annually to the Gartner European Telco CIO forum. Due to the limited range of costs that this second study covered we have not undertaken any detailed analysis of the associated reports and they have not been considered when we formulate our final efficiency proposals. We consider the Deloitte study below, after our discussion of the AT Kearney study.

AT Kearney study

A29.173 BT provided us with details behind the AT Kearney study.¹⁷¹ AT Kearney [§]. The benchmarking compared performance [§].

A29.174 We have used this study to calculate the efficiency gap. [§].

A29.175 As in the June 2015 LLCC Consultation, we believe it is appropriate to reduce the overall cost gap to reflect where costs were lower than the benchmark. Different companies are run and organised in different ways and there will be different ways of achieving efficiencies and cost savings.

A29.176 We have then taken steps to make the results more relevant to costs for leased line services. BT provided us with details on how [§].¹⁷² [§].

A29.177 AT Kearney noted that [§].¹⁷³ [§].¹⁷⁴ [§].

A29.178 We make some further observations on the study and our analysis:

- [§].
- [§].

A29.179 [§]:

- [§].¹⁷⁵
- [§].¹⁷⁶ [§].
- [§].

A29.180 Whilst this study provides an external insight into BT's relative cost performance, we have concerns about some of the data and, as the study related to data

¹⁷⁰ BT response to the 24th s135 request, question C1 and C2

¹⁷¹ BT response to 1st s135 notice, response to question H1

¹⁷² Email from [§]

¹⁷³ [§]

¹⁷⁴ [§]

¹⁷⁵ [§]

¹⁷⁶ [§]

collected in [3<], we now regard it as providing a historical view. Our estimated efficiency gains based on this study are lower than those from our analysis of BT's management accounting data but they only reflect catch-up and do not consider the same range of costs to which we apply our efficiency assumption. Our analysis does however show that BT was not at the frontier, that there were cost gaps even when compared to a [3<] and that there were gaps in activities that related to costs of both Ethernet and TI services.

A29.181 Lastly we respond to BT's challenge that we considered this study of limited use in the WBA market review, but now consider it relevant for the 2016 LLCC. In the WBA market review we received the results of this study relatively late in the process. BT had submitted the study to us as evidence of limited cost savings in WBA markets although it expressed caution over how to interpret the results. The timing in particular limited the analysis we were able to do for that statement and our ability to understand its conclusions.¹⁷⁷ In the 2014 FAMR Statement we said that "*we consider the report provides a useful external source of benchmarking data*".¹⁷⁸ Our work for this charge control has enabled us to give greater consideration to this study. However as we note above we now no longer consider it particularly relevant as it only provides a somewhat out of date view of catch-up.

The Deloitte study

A29.182 Next, we consider the TFP study of telecoms operators that BT commissioned from Deloitte. This calculated TFP growth for nine telecommunications operators (including BT)¹⁷⁹ over the period 2002 to 2014. TFP was calculated using two measures: a Törnqvist fixed base and chained indices. Estimates for some of the companies suggested negative TFP growth.¹⁸⁰ Deloitte noted that there was "*some volatility in the results but this is to be expected*" and so results for individual operators may "*not necessarily be informative*" and may be "*affected by idiosyncratic effects*" so "*an average across the sample of operators can produce a good estimate of general trend within the industry*".¹⁸¹ Deloitte estimated average TFP growth across its sample to be 0.5-0.7% per annum or 1.1-1.3% if the results from KPN and Magyar Telecom were omitted. Deloitte's estimate for BT was 1-1.2%.¹⁸²

A29.183 We met Deloitte to better understand the methodology and results of the study and as a result Deloitte provided a follow-up note on its analysis.¹⁸³ In this Deloitte noted that "*The purpose of carrying out a TFP growth estimate was to demonstrate the magnitude of the difference between the average growth of TFP in a selection of fixed line operators and the estimate of efficiency growth included in Ofcom's*

¹⁷⁷ June 2014 WBA statement, paragraph A7.162

¹⁷⁸ June 2014 FAMR Statements, Annex 16, paragraph A16.91

¹⁷⁹ KPN, Magyar Telecom, Telecom Italia, TPSA Poland, Eircom, Telekom Austria, Belgacom, Telecom Norway and BT.

¹⁸⁰ Annex G, BT response to the June 2015 LLCC Consultation, pages 22 and 23

¹⁸¹ Annex G, BT response to the June 2015 LLCC Consultation, page 22

¹⁸² Annex G, BT response to the June 2015 LLCC Consultation, Tables 3 and 4, pages 22 and 23.

¹⁸³ Follow-up note from Deloitte, provided by BT in response to question E1 of the 35th s135 Notice. On 25 April 2016, BT provided the Deloitte report *BCMR 2015 – Efficiency estimation. Review of Ofcom's approach*, 19 August 2015, available at <http://stakeholders.ofcom.org.uk/binaries/consultations/bcmr-update-proposed-leased-lines-charge-controls/annexes/deloitte-efficiency-estimation.pdf>. The report contains a non-confidential version of the follow-up note from Deloitte attached as appendix.

*price control. It was not intended to be an accurate estimate of the forecasted efficiency of BT's business".*¹⁸⁴

A29.184 We note, firstly, that Deloitte's historic efficiency estimate for BT is very different and much lower than those we have estimated from other sources, notably our analysis of regulatory accounting data and management accounting data. It also seems very low in light of public comments that BT has made about its cost transformation activities (see below). We therefore question whether the study provides reasonable estimates of the cost savings that we are trying to capture within the charge control for BT. In addition, if the resulting estimates for BT are not comparable this may also suggest that the resulting estimates for other operators are not relevant for our analysis.

A29.185 TFP studies of the type undertaken by Deloitte consider the change in an output index against the change in an input index. The results will depend on the choice of data used to construct these indices. We discussed this with Deloitte and noted that Deloitte's output indices¹⁸⁵ may have understated growth. Firstly, we noted that it had omitted some products. For example, the output index did not include any measures of leased line services – so it did not reflect the recent rapid growth in Ethernet services. Secondly, the broadband output measure did not reflect the change in mix from standard ADSL services to much higher bandwidth superfast broadband services.

- Deloitte explained that there was limited data available on the omitted products we had raised. However, it would only expect *"the omission of products ... to have a significant effect if the growth rates of the omitted products were systematically different from the growth rates of the included products"*. Deloitte then said that *"the products included in the output index account for around 65% of total fixed revenues of the operators in the dataset"*. This was *"relatively stable over time for each operator"*. Deloitte concluded that there was then *"nothing to suggest that there are major changes in the proportion of the companies' total outputs included in the output index over time"*.¹⁸⁶
- With respect to our comments on changes in mix, Deloitte said that it had aggregated sub-products in its index calculations. It said that as *"TFP is an aggregate measure of productivity ... [that] aggregation per se would not be expected to unduly affect the results"*. It noted that high quality products can be assumed to require more inputs than low quality products. In relation to superfast broadband, Deloitte felt there were reasons to consider why the impact was limited. Penetration of superfast broadband only reached significant levels later in the period so it would have been unlikely to have had a major impact on the average results across the whole period. Deloitte also noted that *"there is no discernible relationship between superfast broadband and TFP growth in the dataset"*.¹⁸⁷

A29.186 We do not agree with Deloitte's arguments. We believe that the choice of output data will have understated output growth. For example, the major component for Deloitte's output index is likely to have been PSTN lines. Volumes for these will have remained broadly flat over the period (assuming that the index includes all

¹⁸⁴ Follow-up note from Deloitte, provided by BT in response to question E1 of the 35th s135 Notice

¹⁸⁵ Annex G, BT response to the June 2015 LLCC Consultation, P.22-23

¹⁸⁶ Follow-up note from Deloitte, provided by BT in response to question E1 of the 35th s135 Notice

¹⁸⁷ Follow-up note from Deloitte, provided by BT in response to question E1 of the 35th s135 Notice

wholesale lines such as unbundled local loops as it should have done). Prices for line rentals have been relatively static and if anything, they may have been increasing over time. In contrast, prices for many of the other services, notably Ethernet and broadband services, have been decreasing. Therefore the revenue shares of the omitted products may well have been a constant share of total revenues but these are the products for which output is growing and this growth will not have been included in the index.

A29.187 We also note that it is not surprising that there is no discernible relationship between superfast broadband and TFP in Deloitte's data set as it has not been included in the outputs. We also reject Deloitte's point that growth in superfast broadband would not have had a major impact on the average results. We are interested in the potential efficiency gains over the charge control period. While the average over the period 2002 to 2014 is relevant it is not as relevant as what it has been over the more recent period, say from 2010. We accept Deloitte's point that high quality products will require more inputs. However, Deloitte excluded the higher output from superfast broadband lines in its output index but included the costs within its input index via closing Net Book Values (NBVs) and operating expenses. This provides further evidence of Deloitte's inconsistent treatment.

A29.188 We also have concerns about Deloitte's input index. It has been constructed from staff numbers, closing NBV and operating expenses. Deloitte's input index is therefore not consistent with our modelling approach as we apply our efficiency assumption to capex, not NBVs. This is compounded by the fact that Deloitte's index will only partially reflect these changes in capex. NBVs reflect investment over many years: changes in capex are therefore "diluted" by the impact of past investment. BT has reduced its capex considerably in recent years. BT Group's capex was £3.3bn in 2007/8¹⁸⁸ and £2.3bn in 2014/15 (net of government grants).¹⁸⁹ Lastly there may be double counting issues by considering staff numbers (which will include staff whose pay is capitalised) and net book values (which include the historic costs of capitalised pay).

We have also considered other alternative sources of evidence

A29.189 In its responses to the June and November 2015 LLC Consultations BT also highlighted a number of other historic TFP telecoms studies. We discuss our consideration of these studies below.

The NERA and KPMG studies

A29.190 The NERA studies analysed data from 1996 to 2006, while the KPMG study considered data from 1987 to 2006.¹⁹⁰ We think it would be wrong to rely on studies that analysed changes in costs over periods that long ago, preceding the start of the relevant control period. It is doubtful that such changes are relevant to how costs may change over the charge control period even assuming the studies analysed cost in ways that are consistent with our charge control modelling approach.

¹⁸⁸ See for example page 160 of BT's 2011 Annual Report and Accounts.

¹⁸⁹ See for example page 207 of BT's 2015 Annual Report and Accounts.

¹⁹⁰ BT response to the June 2015 LLCC Consultation – Annex E, August 2015, page 5, Table 1.

The 2013 Deloitte report

A29.191 We gave little weight to this Deloitte report from 2013 in both the June 2014 FAMR and WBA statements. In the June 2014 FAMR statement we said: *“Overall we consider that the Deloitte report has significant limitations, and so place little weight on it in our consideration of an appropriate efficiency target. The updated study does not address the concerns we raised with the earlier Deloitte report”*.¹⁹¹

Economy wide TFP studies

A29.192 We have reviewed the economy wide TFP studies that BT referred to and some other more recent studies.¹⁹² 2015 OBR forecasts suggest that productivity per hour across the economy should increase from 1.5% in 2016 to 1.9% in 2017 and 2.2% in 2018.¹⁹³ However, this study only measures labour productivity. Most economy wide studies we reviewed show that sectors including telecommunications have higher TFP growth than other sectors.¹⁹⁴ TFP growth in sectors that included telecommunications is in the region of 3.5-7.3%.^{195 196} BT has suggested that these higher rates are due to changes in the mobile communication sector, (i.e. as opposed to fixed line operators) but provides no evidence to support this claim.

A29.193 There are however methodological issues that limit the amount of weight we can place on these studies. Many of the studies analyse data that is now quite out of date. The Reckon report analysed data from 1970 to 2007.¹⁹⁷ It is only the most recent ONS 2015 study that considered data up to 2013; previous studies analysed data to 2010 which is now 6 years old. The wide sector definitions also limit the inferences that can be made for BT. For example, the 2013 ONS study included telecommunications within “Eleccom” which also covered electrical machinery and post.¹⁹⁸ The 2015 ONS included telecoms within the Information and Communication sector. This sector also included internet activities, radio and TV industries, the sound recording industry, publishing and motion picture production.¹⁹⁹

¹⁹¹ Paragraph A16.81, Annex 16 of the June 2014 FAMR Statement. In this quote the Deloitte Report refers to its 2013 Report. The earlier Deloitte report refers to a study in undertook in 2012 for BT.

¹⁹² We have considered studies from: CEPA, OBR, ONS, and Reckon among others.

¹⁹³ OBR, Economic and Fiscal Outlook, November 2015, Table 3.6

http://budgetresponsibility.org.uk/docs/dlm_uploads/EFO_November__2015.pdf

¹⁹⁴ CEPA, Scope for improvement in the efficiency of network rail's expenditure on support and operations, March 2012, Figure A1.2 http://orr.gov.uk/_data/assets/pdf_file/0013/517/cepa-orr-om-productivity-over-cp5.pdf and; Reckon, Productivity and unit cost change in UK regulated network industries and other UK sectors, 20 May 2011, Table 28

¹⁹⁵ Reckon, Productivity and unit cost change in UK regulated network industries and other UK sectors, 20 May 2011, Table 28 http://orr.gov.uk/_data/assets/pdf_file/0017/1916/reckon_200511.pdf

¹⁹⁶ ONS, Micro-data perspectives on the UK Productivity Conundrum – An update, 4 October 2013, Table 4, http://www.ons.gov.uk/ons/dcp171766_329419.pdf

¹⁹⁷ Reckon, Productivity and unit cost change in UK regulated network industries and other UK sectors, 20 May 2011, P.7

¹⁹⁸ ONS, Micro-data perspectives on the UK Productivity Conundrum, January 2013

http://www.ons.gov.uk/ons/dcp171766_295470.pdf

¹⁹⁹ UK Service Industries: definition, classification and evolution, ONS, definition of the information and communication section, page 4

<http://www.google.co.uk/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=0ahUK EwiVoPaU5bPLAhVDQBQKHxO6ASYQFggcMAA&url=http%3A%2F%2Fwww.ons.gov.uk%2Fons%2Frel%2Fnaa1-rd%2Fnational-accounts-articles%2Fuk-service-industries--definition--classification-and-evolution%2Fuk-service-industries-pdf.pdf&usq=AFQjCNF31jBPNPWjYGGALrXsQBAsVP9NtQ>

A29.194 The 2015 ONS study also had quite variable results. Whilst “multi-factor productivity” over the period 1998-2013 averaged 3.77% per annum, it was 0.92% between over 2008-2013 and 0.4% in 2013. Again, these more recent results are much lower than those we have estimated from BT internal data.

A29.195 Lastly we have been unable to clarify exactly how the various output and input indices have been constructed. So there is a concern that the results may not be consistent with the range of costs that are covered by our efficiency assumption or that they treat changes in volumes in a different way to the charge control model.

Other regulators

A29.196 Lastly, we have briefly reviewed the evidence from BT on frontier shift estimates from different regulators. We do not believe this is relevant evidence for this charge control. Neither BT nor FTI has demonstrated that technical progress in other sectors, such as water, gas, rail or electricity, is relevant to telecommunications.

Our conclusions on other alternative sources of evidence

A29.197 While we agree with BT that it is relevant to consider evidence from sources outside BT, we consider that that evidence has to be relevant and reliable. We have found such issues with all the evidence that we have reviewed.

Review of other information such as BT statements and brokers’ and analysts’ reports on BT

We have reviewed public statements by BT and other external views on BT’s cost transformation programmes

June 2015 LLCC Consultation

A29.198 In the June 2015 LLCC Consultation, we reviewed two sources of public information on BT’s cost performance: analysts’ reports following a Cost Transformation teach-in that BT held in December 2014²⁰⁰ and BT’s press releases following the announcement of BT Group plc’s results for 2014/15 in May 2015. We considered that although the statements and results did not specifically refer to business connectivity markets, nor reflect any changes in volumes, they did provide evidence that BT continued to cut costs and improve its efficiency. We also stated that they showed that there were reductions in operating costs in divisions such as Openreach and BT Wholesale that contribute costs to both TI and Ethernet services and that some of these reductions would have been as a result of cost reductions in TSO.

Stakeholders’ comments

A29.199 We received comments from three stakeholders on our review of public information: BT, Vodafone and UKCTA.

A29.200 BT considered that we had put too much focus on public announcements on efficiency savings. BT submitted a report by FTI. In this report, FTI stated that in

²⁰⁰ BT, *Cost Transformation Teach-in*, 9 December 2014, https://www.btplc.com/Sharesandperformance/Presentations/downloads/CTteach-in_9Dec2014.pdf

these announcements it is not clear where the savings will come from, be it efficiency, volume effects, or input price effects. Moreover, messages to the investor community tended to be at a high level and did not identify the business units, cost types or products.²⁰¹

A29.201 Vodafone quoted comments made by the BT Group Finance Director, Tony Chanmugam, in an interview that *“Further cost reductions have been earmarked for 2015 through to 2017, while the cost transformation team benchmarks against European telcos to identify further opportunities”*.²⁰² Vodafone went onto comment that the European fixed line incumbent sector may not represent the leading edge of efficiency and quoted Tony Chanmugam again as saying *“the sector isn’t always the most efficient. If I look at customer service, I don’t really want to be benchmarked in the sector as a business – I would rather be benchmarked compared with the Amazons of the world”*.²⁰³

A29.202 Vodafone also submitted a report by Frontier. In the report, Frontier noted that *“financial data and statements to investors issued by BT can provide additional evidence on whether the rate of change in efficiency can be expected to change, but is unlikely to be directly applicable to a small set of services such as leased lines”*.²⁰⁴ With reference to BT’s cost transformation teach-in, Frontier argued that *“the identification of cost reductions by managers may not be perfect, with some ongoing efficiency improvements not fully identified or the impact of input price and volume effects not properly controlled”*.²⁰⁵

A29.203 Frontier presented further quotes from the teach-in transcript to support the view that BT had made significant efficiency improvements in the past and that it expected that these would continue in the future. In particular it noted BT comments that *“because of what we do in terms of cost transformation we confidently say to you that in 2015/16 we will grow our EBITDA”*, that there are *“still more than £1bn of gross cost saving opportunities”* and *“on a bottom up basis it still shows a lot of opportunity”*.²⁰⁶

A29.204 Frontier also provided quotes from the Head of Cost Transformation at BT about cost transformation opportunities in TSO, notably in the IT estate where *“we believe there is at least another further twice the benefits that we have delivered to date yet to come and yet to go after”*.²⁰⁷

A29.205 UKCTA noted various quotes from BT’s 2015 Annual Report. These included comments on the overall reduction in operating, depreciation and amortisation costs and that BT expressed confidence that there are *“plenty of opportunities to reduce costs further”*. UKCTA also referred to specific costs reduction initiatives including £36m power cost reductions, reduced vehicle fleet operating costs and the use of innovative apps that will improve engineer efficiency. UKCTA went on to say that *“We believe these various actions will cumulatively result in the achievement of cost*

²⁰¹ BT, Response to the June 2015 LLCC Consultation – Annex E, August 2015, P.15, para 51

²⁰² <http://www.financialdirector.co.uk/financial-director/interview/2403890/interview-bt-group-fd-tony-chanmugam>

²⁰³ Vodafone response to June 2015 consultation p31, paragraph 5.5

²⁰⁴ Frontier Consulting, June 2015 LLCC Consultation, Efficiency, August 2015, page 4

²⁰⁵ Frontier Consulting, June 2015 LLCC Consultation, Efficiency, August 2015, page 6

²⁰⁶ Frontier Consulting, June 2015 LLCC Consultation, Efficiency, August 2015, page 7

²⁰⁷ Frontier Consulting, June 2015 LLCC Consultation, Efficiency, August 2015, page 7

reductions attributable to business connectivity services in excess of those that Ofcom anticipates".²⁰⁸

Our conclusions

A29.206 In our June 2015 LLCC Consultation we noted that BT's conclusions at the Cost transformation teach-in were that "*Cost transformation continues at pace*", with "*plenty more opportunities identified*" and that costs transformation was "*a key part of [BT's] strategy, supporting customer service and investing for growth*".²⁰⁹

A29.207 We also commented on various analysts' published views on BT's cost transformation plans following this teach-in. Those we reviewed appeared to accept BT's proposition that it had the potential to continue to cut costs quite significantly but that these reductions may be more difficult to achieve in the future. We consider that this provided qualitative support for the view that BT has opportunities to continue to cut costs over the charge control period.

A29.208 The press releases following the announcement of BT plc's 2014/15 financial year results²¹⁰ had the headline of EBITDA being up 3%, despite a fall in underlying revenue of 0.4%, due to BT taking costs out of the business.²¹¹ The impact and importance of cost transformation programmes on BT's financial performance was highlighted by further quotes. For example net labour costs reduced as BT "*increased productivity while reallocating [its] labour resource to be more efficient*".²¹² BT also noted that "*we continue to focus on transforming our cost base*"²¹³ and that "*Our extensive cost transformation programmes continue to deliver*".²¹⁴

A29.209 Both BT and Frontier noted that the information we reviewed for the June 2015 LLCC Consultation and indeed evidence of this form suffers from not being business unit or product specific nor does it identify where the cost savings are generated from within a business. We also agree with Frontier that such evidence may also overstate or understate future cost saving opportunities. Such evidence does however provide qualitative evidence that senior management within BT consider that it can continue to cut costs, potentially quite significantly, and continue to improve efficiency. Furthermore, it confirms that there have been cost reductions in divisions such as Openreach and BT Wholesale that contribute costs to both TI and Ethernet services.

We have reviewed other more recent public information

A29.210 Given this view and the above comments from stakeholders we have reviewed more recent sources of public information on BT's cost performance. In particular we have reviewed a presentation that BT provided for an investor meeting to discuss the Q3 2015/16 results in February 2016 and BT's press releases and other information provided to support the announcement of its quarterly financial results

²⁰⁸ UKCTA response to the June 2015 LLCC Consultation, August 2015, P.11-12, paragraph 2.10 <http://stakeholders.ofcom.org.uk/binaries/consultations/llcc-dark-fibre/responses/UKCTA.pdf>

²⁰⁹ BT, *Cost Transformation Teach-in*, 9 December 2014, Slide 37

²¹⁰ <http://www.btplc.com/News/ResultsPDF/q415-release.pdf>

²¹¹ BT's 2014/15 Q4 press release, page 1. Underlying revenue is "underlying revenue excluding transit"

²¹² BT's 2014/15 Q4 press release, page 5

²¹³ BT's 2014/15 Q4 press release, page 9

²¹⁴ BT's 2014/15 Q4 press release, page 30

for 2015/16. We have not been able to find any further analyst reports that comment on BT's cost transformation opportunities beyond those we reviewed for the June 2015 LLCC Consultation.

BT investor meeting on Q3 2015/16 results

A29.211 BT presented several slides²¹⁵ on its cost transformation programme. Slide 13 showed the effect of the cost transformation programme over the period 2008/09 to 2014/15 on both operating costs and capex,^{216 217} with total savings over the period across the group of c£5.5bn. This is a reduction of roughly 5.3% per annum in nominal terms;²¹⁸ reductions in real terms would therefore have been at around 8% per annum.²¹⁹ A note on the slide said that there were "*still more than £1bn of gross cost saving opportunities*".

A29.212 Slide 15 gave three examples of cost transformation initiatives. The first concerned savings on network planning and engineering support activity, the last on travel and subsistence costs. Both of these activities would contribute to savings in regulated markets, including leased line services.

A29.213 Slide 16 showed that net labour costs have reduced across the group by roughly 20% over the period 2009/10 to 2014/15, again in nominal terms.

A29.214 We do not think the above 20% reported savings should be interpreted as efficiency savings as they make no allowance for changes in volumes or inflation. However we believe that if anything the 20% will understate costs savings if we take these into account using the approach within the 2016 LLCC model.²²⁰ As a minimum the slides again demonstrate BT's focus on cost transformation activities.

A29.215 Finally slide 24 of the presentation noted that BT is confident of cost "synergies" as a result of its recent merger with EE. BT estimates that "*Total opex and capex synergies in 4th full year post completion*" would be c. £360m and "*Total NPV of opex and capex synergies post integration costs*" would be c£3.0bn. Although the merger of the two companies is unlikely to result in immediate cost reductions in business connectivity markets, it seems likely that some synergies in overheads will result in lower costs across all markets over the charge control period.

BT's reported financial performance

A29.216 We have reviewed BT's press releases for the first three quarters results for the 2015/16 financial year. These confirm that BT is reducing costs due to efficiencies achieved through its cost transformation programs.

²¹⁵ Slides 12-16, http://www.btplc.com/Sharesandperformance/Quarterlyresults/BT_Q3_2015-16_InvestorMeetings_Presentation.pdf

²¹⁶ BT explained that Operating costs were before specific items, depreciation & amortisation. 2008/9 operating costs estimated for impact of historic Other Operating Income restatement. Capital expenditure is before purchase of telecommunications licences.

²¹⁷ This was the same slide that BT presented at the 2015 Annual General Meeting. Slide 14 <http://www.btplc.com/Sharesandperformance/AGMs/AGM2015/2015AGMslidedeck.pdf>

²¹⁸ The reductions ranged from a low of 0.9% in 2013/14 to a high of 8.2% in 2012/13.

²¹⁹ Converted to real terms using ONS CPI table <http://www.ons.gov.uk/ons/datasets-and-tables/data-selector.html?cdid=D7BT&dataset=mm23&table-id=1.1>

²²⁰ Inflation is small but positive. Our analysis of volumes when estimating efficiency from BT internal Management Accounting data suggests low but positive volume growth across the Group. See paragraphs A29.126 to A29.131 above

A29.217 The 2015/16 Q1 results,²²¹ released on 30 July 2015, imply that there has been efficiency on capital expenditure for the group in the past few years. BT stated *"Depreciation and amortisation of £628m was down 4% largely due to more efficient delivery of our capital investment programmes in recent years and some assets becoming fully depreciated."*²²²

A29.218 The 2015/16 Q1 results also reported BT Wholesale operating costs decreased 2% while underlying operating costs excluding transit were up 3% reflecting the increased volumes in managed solutions. BT noted that this increase was *"partially offset by a 17% reduction in selling and general administration costs as we continue to focus on our cost transformation activities"*.²²³

A29.219 On 29 October 2015, BT released its Q2 results²²⁴ for financial year 2015/16. For BT Group the adjusted²²⁵ operating costs were flat year on year with a decrease of net labour costs of 1%.²²⁶ BT noted that, *"this decrease was despite £20m (Q2 2014/15: £1m) of leaver costs and an £8m increase in the pensions operating charge. Excluding these, net labour costs were down 4% due to further efficiencies achieved by our cost transformation programmes"*.²²⁷

A29.220 Similarly, BT Wholesale reported a 3% reduction in operating costs while underlying operating costs excluding transit increased 4% reflecting the increased volumes in IP services. BT Wholesale claimed that these however were offset by a *"15% reduction in selling and general administration costs as we continue to focus on our cost transformation activities."*²²⁸

A29.221 Openreach reported flat operating costs year on year despite increased revenue growth and investments being made to increase customer service. Openreach noted that the reason costs were able to be kept flat was due to *"our cost transformation activities"*.²²⁹ This is consistent with the forecast within the business unit reviews which forecasts Openreach to only reduce operating costs by 1% in the year to 2015/16.

A29.222 In a response to a question raised in the Q2 results announcement, regarding the timing of these cost savings, Tony Chanmugam (BT Group Finance Director) stated that *"In terms of the £1bn, we've never said it is going to be over 3 years, 5 years or 1 year. What I would say is the rate of gross transformation savings we are making is not slowing down. So when I look at the absolute levels of savings we are going to deliver this year compared to last year, it will be broadly similar."*²³⁰

²²¹ <http://www.btplc.com/Sharesandperformance/Quarterlyresults/2015-2016/Q1/Downloads/Newsrelease/q115-release.pdf>

²²² BT's 2015/16 Q1 press release page 5

²²³ BT's 2015/16 Q1 press release page 10

²²⁴ <http://www.btplc.com/Sharesandperformance/Quarterlyresults/2015-2016/Q2/Downloads/Newsrelease/q215-release.pdf>

²²⁵ Before depreciation and amortisation

²²⁶ Excluding foreign exchange movements and the effect of acquisitions and disposals.

²²⁷ BT's 2015/16 Q2 press release page 5

²²⁸ BT's 2015/16 Q2 press release page 11

²²⁹ BT's 2015/16 Q2 press release page 12

²³⁰ Response to question 11 in the BT transcript from quarter 2 results, page 13.

<http://www.btplc.com/Sharesandperformance/Quarterlyresults/2015-2016/Q2/Downloads/Webcast/Q215-16Transcript-FINAL.pdf>

A29.223 Tony Chanmugam further went on to state *“If I look at the cost transformation programme generically, we have got 60 odd live programmes running at this point in time that will deliver this year, which will have an annualised impact next year, and some of these programmes will also deliver incremental [savings] next year. So if you look at it in terms of that window, we know what we are doing, we know there is going to be deliveries and when it comes to this time next year, we will have another set of programmes because the opportunities are there.”*²³¹

A29.224 The 2015/16 Q3 results,²³² released on 1 February 2016, contained further announcements of cost savings. BT Wholesale reported an *“8% reduction in selling and general administration costs as we continue to focus on our cost transformation activities”*.²³³ Openreach also reported efficiency improvements: *“Operating costs grew 2% mainly reflecting a £22m increase in leaver costs which was partly offset by cost efficiencies.”*²³⁴

A29.225 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.

Conclusions

A29.226 We acknowledge that the above public statements are not specific to business connectivity markets and do not reflect changes in volumes. However, BT's more recent statements together with the public information we reviewed for the June 2015 LLCC Consultation confirm that BT has cut costs through its cost transformation programmes and that it believes there are still significant opportunities to continue to do so over the charge control period and at a similar rate to those in the past. Savings have been reported in Openreach and BT Wholesale and some publicly announced cost transformation initiatives are targeted on network activities. We therefore consider that these statements provide qualitative evidence that cost savings will continue to materialise in business connectivity markets at levels not dissimilar to those achieved in the past. We give this evidence a low to moderate weight to inform our estimates of potential efficiency gains.

Our overall conclusions on operating costs

We have decided to adopt an efficiency target for Ethernet services of 5.0% and an efficiency target for TI services of 4.5% for operating costs

A29.227 We have considered a range of different evidence when considering the efficiency estimates to be applied in this charge control. To produce our efficiency forecasts we have therefore balanced the available evidence together to take account of the relevance of the evidence (in terms of to the services we are considering and the time period we are seeking to forecast), reliability (in terms of our consideration of

²³¹ Response to question 11 found in the BT transcript from quarter 2 results, page 13.

<http://www.btplc.com/Sharesandperformance/Quarterlyresults/2015-2016/Q2/Downloads/Webcast/Q215-16Transcript-FINAL.pdf>

²³² <http://www.btplc.com/Sharesandperformance/Quarterlyresults/2015-2016/Q3/Downloads/Newsrelease/q316-release.pdf>

²³³ BT's 2015/16 Q3 press release page 12

²³⁴ BT's 2015/16 Q3 press release page 13

the robustness of the analysis and evidence) and compatibility with our modelling approach adopted within the 2016 LLCC Model. Below we discuss the relative weightings of each area of evidence discussed in this annex.

A29.228 We give the **past efficiency assumptions used on other recent telecommunication charge controls** (including the 2013 LLCC) little weight for two reasons. Firstly, we consider that it is appropriate to give more weight to the more recent and relevant evidence. We disagree with BT that “*Ofcom’s summary of efficiency assumptions used in previous charge controls as a ‘context and a base’ to set its proposed range entrenches its approach*”.²³⁵ Indeed, we consider that it would be wrong to place much weight for this review on these previous estimates given the range of costs we now consider more appropriate to assess and the historic nature of the estimates. Secondly, we note as we did in the June 2015 LLCC Consultation, that our analysis for this review shows that efficiency on TI and Ethernet services over the past few years is likely to have been higher than we forecast for the 2013 LLCC.²³⁶

A29.229 In relation to our **regulatory cost analysis** we gave this area of analysis a relatively low weight in the June 2015 LLCC Consultation mainly because of the large variations in the results for different years. In addition our previous analysis only considered historical efficiency up to 2013/14. We have however now refined our analysis and have included cost data for 2014/15. Our updated results are more stable, particularly for TI services. This approach estimates efficiency for TI services at [3<] [5-10]% per annum and [3<] [5-10]% for Ethernet services.

A29.230 The advantage of this analysis is that it is consistent with the way we treat costs within the 2016 LLCC Model and so is consistent with our overall modelling approach. The drawbacks are that it does not provide any view of forecast efficiency, only providing historical estimates and that major reallocations in 2012/13 have limited the data we can rely on. Further, because of reallocation effects over time, our analysis may have slightly overstated efficiency for TI services and understated it Ethernet services.²³⁷ However, because of the refinements to our analysis and inclusion of 2014/15 data, we have a greater degree of confidence than at consultation stage and therefore place more weight on our latest analysis. This is consistent with the arguments made by both BT and Frontier (on behalf of Vodafone) in their responses to the June 2015 LLCC Consultation who both suggested we should give this analysis more weight in our final considerations.

A29.231 We believe our analysis of BT’s historic and future forecast **internal management accounting data** provides the most relevant and reliable evidence for proposing efficiency assumptions for Ethernet and TI services for the duration of the charge control periods. We have updated and developed our analysis, building on our proposals in the June and November 2015 LLCC Consultations, so that the approach to analysing changes in costs is now more consistent with that within the our 2015 LLCC Model. This analysis importantly also provides a view of both BT’s recent past efficiency achievements and its forecast internal efficiency and cost transformation targets out to 2016/17. Our estimates of average historical efficiency from both BT’s forecast PVEOs and its internal management accounts were very similar.

²³⁵ See paragraph A29.41 above

²³⁶ See Annex 5 of the June 2015 LLCC Consultation.

²³⁷ See paragraph A29.85 above

A29.232 This analysis suggested efficiency of 3.2-5.6% for TI services and 3.8-6.4% for Ethernet services. We note that these results produce slightly lower efficiency estimates than our **regulatory costs analysis** results. However the estimates based on management accounting data cover a longer period including forecast periods and are less affected by reallocation issues.

A29.233 We consider appropriate **benchmarking data and other external studies** can provide a potentially informative source of evidence. However, in addition to the normal issues associated with interpreting this type of benchmarking data -for example whether comparisons are like-for-like and take account of relevant exogenous factors – we had further concerns about the studies we considered. These related to consistency with our modelling approach and in particular the range of costs covered. Finally we note the BT Group Finance Director's comments that the sector is not necessarily the most efficient which again casts doubt on the relevance of recent comparisons with other telecommunications companies. We therefore attach a lower weight to the following benchmarking evidence than other evidence assessed for this review:

- **The AT Kearney study:** this only provided an estimate of catch-up efficiency but is now somewhat out of date;
- **The 2015 Deloitte study :** there were several issues with this study including that the output index is likely to have understated growth and the input index is inconsistent with our modelling approach;
- **The 2013 Deloitte report:** we gave little weight to this report in both the June 2014 FAMR Statement and June 2014 WBA Statement. It is now a further two years since this report was prepared;
- **The NERA and KPMG studies:** these studies now significantly precede the relevant control period;
- **Economy wide TFP studies:** these consistently show that growth in sectors that included telecoms had higher productivity growth than the economy as a whole. However recent, results even for those sectors, are significantly different to those for BT.
- **Other regulators evidence:** we do not believe this provides relevant evidence in relation to leased lines services.

A29.234 Although, we consider that none of these studies are sufficiently robust for us to place much weight on individually, we nonetheless note that most studies produced historical estimates that are considerably lower than those from our analysis of BT's regulatory accounting and internal management accounting data.

A29.235 Our review of public statements by BT and other external views on BT's cost transformation programme confirmed that BT has reduced costs through its cost transformation programmes and savings have been reported in both Openreach and BT Wholesale. BT has also said that there are opportunities to continue to cut costs in the future; BT's Group Finance Director has recently commented that the gross level of cost transformation savings is not slowing down.²³⁸ Some publicly announced cost transformation initiatives are targeted on network activities. We

²³⁸ See paragraph A29.223 and A29.224 above.

therefore believe that these statements provide qualitative evidence that cost savings will continue to materialise in relation to leased lines services at levels not dissimilar to those achieved in the past. This gives us more confidence in using evidence from historic data for BT as an indication of whether similar rates may be achievable in the future.

A29.236 We have looked at the evidence in the round when setting our efficiency target. We agree with the Competition Commission that in a system of incentive-based regulation, our objective should be to set a challenging but achievable target, which is not easy to meet, but also capable of being exceeded. In deriving our efficiency targets we have placed most weight on the regulatory cost analysis and management cost accounting data for the reasons stated above. We have used these to derive our range, and used other sources to inform where we should be on that range. The range which we have derived is from 3.8-6.4% for Ethernet services and 3.2-5.6% for TI services.

A29.237 We consider that operating costs efficiency targets of 5.0% for Ethernet services and 4.5% for TI services are consistent with our objectives. As these targets are within the range of BT's past and forecast efficiency, we consider that they are capable of being met. As they are higher than the majority of benchmarking studies, and higher than the bottom of the range suggested by analysis of BT's past and forecast efficiency, we consider that they are both challenging and not easy to meet. As they are not at the top of the range, we consider that they are achievable and capable of being exceeded. We therefore consider that they are consistent with our objectives.

Efficiency on capital expenditure

We have adopted a capex efficiency target of 4% for Ethernet services but made no assumption on capex efficiency for TI services

A29.238 In the 2016 LLCC Model our forecasts of capital expenditure are made up of two elements: steady state capex and growth capex. We forecast growth capex using component growth rates and asset volume elasticities. Whilst we forecast these elements separately both are subject to our assumptions on asset price inflation and efficiency.²³⁹

June 2015 LLCC Consultation

A29.239 In our June 2015 LLCC Consultation we did not include capital expenditure within our regulatory cost analysis. We did however include capital expenditure incurred by BT Wholesale and non NGA capex incurred by Openreach in our analysis of BT management accounting data. However, we noted some issues with this data including that it did not appear to include all capital expenditure for BT Wholesale nor any capital expenditure incurred by TSO.

A29.240 Therefore the analysis we undertook for the June 2015 LLCC Consultation considered efficiency achievements for operating costs and capital costs together. Given the available data, we were not able to estimate separate efficiency rates for capex.

²³⁹ We do not apply efficiency to any other capital costs, so, for example, we do not apply the efficiency assumption to depreciation or mean capital employed within the 2016 LLCC Model.

A29.241 Our proposals for capex efficiency were therefore the same as for operating costs efficiency with a 3-7% per annum assumption for Ethernet Services and 2-6% assumption for TI services following the November Consultation.

Stakeholders' comments

A29.242 BT (and Deloitte in a report prepared for BT) was the only stakeholder to provide comments on capital efficiency in its responses to our June 2015 LLCC Consultation.

A29.243 BT considered by *"applying the 5% capex efficiency and a 1.9% real asset price reduction, Ofcom is double-counting the reasonable level of efficiency BT should deliver over the charge control period"*.²⁴⁰

A29.244 BT went onto say that *"It is unclear as to how efficiency can be achieved with physical underlying assets. That is, electronics are required for individual circuits; there is little scope for using this equipment "better" across different circuits. On the other hand, the asset price change assumption can be interpreted as being able to purchase the equipment more cheaply, or purchasing better equipment at the same or lower price (i.e. reflecting the concept of Modern Equivalent Asset)"*.²⁴¹

A29.245 In Annex E of its response to our June 2015 LLCC Consultation BT noted *"Capex efficiency is significantly smaller than operating cost efficiency, but Ofcom applies a single efficiency target to both existing and new capex, as well as opex in its cost forecasting model"*.²⁴²

A29.246 When discussing our proposals for Ethernet BT said *"we agree that analysis of costs using BT's regulatory financial statements can only be carried out on operating costs"*.²⁴³

A29.247 When discussing our proposals for TI services BT noted that we had only applied the efficiency assumption to operating costs for TI service in the 2013 LLCC.²⁴⁴

A29.248 Deloitte commented that *"Efficiencies linked to capex may be significantly lower than for opex"*. In relation to a study it had carried out it noted that *"All BT managers interviewed agreed that the scope for cost reduction initiatives for capex is consistently much smaller than for operating costs. This is because a large proportion of capex is related to contracts with external contractors for construction works. These contracts often cannot be renegotiated and, to the extent they are, have generally seen a price increase rather than decrease in line with the general trend of construction prices"*. It also went on to note that *"for legacy networks and services, capex is primarily related to equipment replacement for which very limited efficiency gains exist."*²⁴⁵

²⁴⁰ BT response to the June 2015 LLCC Consultation, page 25, paragraph 105

²⁴¹ BT response to the June 2015 LLCC Consultation, page 25, paragraph 104

²⁴² BT response to the June 2015 LLCC Consultation, page 19, paragraph 46 of Annex E

²⁴³ BT response to the June 2015 LLCC Consultation, page 45, paragraph 217

²⁴⁴ BT response to the June 2015 LLCC Consultation, page 95, paragraph 502

²⁴⁵ BT response (via Deloitte) to the June 2015 LLCC Consultation, annex G, page 2

Our conclusions

We have made no assumption on efficiency for TI capex

A29.249 The 2016 LLCC Model forecasts no capex for TI services (although it does forecast disposals). Any efficiency assumption on capex on TI services will therefore not affect the calculations within the model and the resulting overall value of X produced.²⁴⁶ Therefore, we have made no assumption on efficiency for capex for TI services.

We have assumed 4% efficiency for Ethernet capex

A29.250 We have not been able to undertake analysis on capex similar to our analysis of BT's operating costs, as we have not been able to identify capex data that is compatible with our modelling approach. BT, like most other companies, does not keep separate records on capital expenditure that is required to meet growth (either steady state or reinstatement requirements).²⁴⁷ We note that BT agreed that it was not possible to use regulatory cost accounting data to analyse capex efficiency.

A29.251 We have, however, taken steps to understand which divisions incur capital expenditure and how that capital expenditure is recorded within BT's regulatory, management and statutory accounts. We have considered management accounting information from BT that shows how capital expenditure incurred in TSO is transferred to other divisions.²⁴⁸ We also have analysed data that shows how capex incurred within each Relevant BT division is attributed across business connectivity markets, other regulated markets and unregulated markets²⁴⁹ and have reconciled this data to management accounting data. Finally, we have analysed regulatory accounting data that shows attributions of capex data by network cost super-component²⁵⁰ and have linked that to capex forecasts by component within the 2016 LLCC Model.

A29.252 We have also considered historical and forecast Openreach capital expenditure by general programme area, including Ethernet based programs.²⁵¹ This shows that Openreach capex on Ethernet programs, following a period of being fairly static, is now growing. However, we have not used this data to assess capital efficiency for two reasons. Firstly, as noted above we would need to have some breakdown of capex between steady state and growth capex. Secondly we understand a large proportion of new connections activity on Ethernet services is capitalised. The decline in the quality of service of provision of Ethernet services has been discussed extensively in other parts of this statement.²⁵² Historical levels of Ethernet capex may therefore have been depressed as a consequence of poor quality of service and may now be rising as a result of efforts to improve it. In addition, we are

²⁴⁶ In any case we would expect that capex efficiency should be low for TI services. There is a relatively low proportion of capitalised pay within capex on TI services. The remainder includes equipment costs. We have no evidence to support a change in asset prices for TI services.

²⁴⁷ This is true for both BT's regulatory accounting and management accounting data

²⁴⁸ BT response to 24th s135 question B1 and BT response to follow up questions on C1 and C2 of the 30th s135.

²⁴⁹ BT revised response to 30th s135 question A1.

²⁵⁰ Regulatory cost data on capital expenditure has been extracted from Additional Financial Information (AFI) Schedule AF13 that BT provides to us annually. BT attributes capex in the same way that it attributes other capital costs.

²⁵¹ BT response to follow up question to 30th s135 question C1-2

²⁵² See Volume I, Section 13 and Volume II, Section 5.

making a separate allowance for quality of service improvements within our base year costs. It would be inappropriate then to use forecast increases in capital expenditure to support a low efficiency target. We therefore believe that once BT has increased its capital expenditure to improve its quality of service that capital expenditure will be more stable. But, the above discussion suggests this historical and forecast data is not likely to be a good representation of on-going capex requirements.

A29.253 Table A29.10 below shows our estimates of which divisions incur capex on Ethernet services.²⁵³

Table A29.10: Breakdown of capital expenditure by division for Ethernet services in 2013/14 and 2014/15

Year	Openreach	TSO
2013/14	[X]	[X]
2014/15	[X]	[X]

Source: Ofcom analysis of data provided by BT in response to the 30th S135 question A1

A29.254 We have considered information on equipment costs associated with the provision of new wholesale Ethernet-based leased line services, including current price lists for equipment over the period 2014/15 to 2018/19.²⁵⁴ We estimate that Ethernet equipment accounts for ([X]) of capex on Ethernet services. For this we have evidence of nominal price reductions of just over [X].

A29.255 Capitalised pay accounts for a relatively high proportion of ([X]) capex on Ethernet services. In general, we would expect labour efficiency on capital activities to be similar to that on operating costs especially for engineering activities, as they would be subject to similar initiatives to improve processes and work scheduling. Weighting together TSO and Openreach labour efficiencies estimated from our analysis of management accounting operating pay costs (after taking account of inflation and volume impacts) suggests an appropriate labour efficiency might be around [X] per annum.²⁵⁵ The remaining capex spend appears to be focused on fibre, duct and software assets. Even assuming there is minimal efficiency on this remainder, the potential efficiencies on Ethernet equipment and capitalised pay suggest it would be wrong to assume no or minimal efficiency on capex for Ethernet services.

A29.256 BT has argued that we are double counting the scope for capex savings through the efficiency assumption and again through asset price changes. We do not agree that we are double counting efficiencies, but we recognise the importance of adopting a consistent approach.

²⁵³ Similar to our analysis on Operating costs we have made a number of adjustments to align the regulatory accounting data with the management accounting data and to better reflect the BT Division in which that capex is incurred. In particular we have removed NGA capex (using BT response to follow up questions C1 and C2 of the 30th s135), removed internal transfers from TSO to Openreach and BTW (using BT response to the 30th s135 question B2), and excluded any capex incurred outside Openreach, BT Wholesale and TSO.

²⁵⁴ BT response to 4th s135 request, question 4a

²⁵⁵ Estimated from our analysis of management accounting and forecast PVEO pay costs (after taking account of inflation and volume impacts) from 2012/13 onwards

A29.257 We have assumed 0% asset price inflation on all assets other than duct.²⁵⁶ That assumption was generated largely from information that supports BT's RFS. Capex on assets other than duct will include spend on Ethernet equipment. BT does not revalue equipment it uses to provide Ethernet services within its RFS.²⁵⁷ Therefore our assumption of zero price inflation is not only consistent with the RFS but also with the base year NRCs within our model. If BT had revalued these assets then NRCs in the base year would have been lower as equipment prices are reducing. The evidence we have suggests that on a like for like basis BT will incur less capex on this equipment than it has in the past. We need to capture these savings within our forecasts. As it is not in the asset price inflation assumption, we include it within the efficiency assumption. We therefore believe there is no double counting of efficiency savings on equipment used to provide Ethernet services.²⁵⁸

A29.258 Our operating pay cost efficiency assumptions were calculated after assuming pay inflation of c3%.²⁵⁹ Our asset price assumption on capitalised pay will be a mix of RPI and zero as some of this is incurred installing duct; the 2016 LLCC Model forecasts that a reasonable proportion of capex will be duct.²⁶⁰ There is then a potential inconsistency if we were to use operating cost efficiencies without any adjustment when estimating capital efficiency. The net effect of this inconsistency is likely to be small and is hard to estimate with any precision. But we consider that it may be appropriate to reduce the pay cost efficiencies we use to estimate capex efficiency by c1-2% per annum. This would reduce the range for efficiency on capitalised pay efficiency, to say [X] per annum.

A29.259 With respect to Deloitte's comments on contractual price increases for infrastructure work we believe this is captured within our asset price assumption on duct and civil infrastructure work of RPI.

A29.260 We do not believe there will be any double counting of efficiency or any inconsistency on the remaining capex if we assume it is subject to minimal efficiency improvements, given that the asset price inflation assumption will also be a mix of RPI and zero.

A29.261 In the light of the above we have decided to adopt a capex efficiency assumption for Ethernet services of 4%. We have calculated this by weighting together:²⁶¹

- our assumed efficiency on capitalised pay of [X]%;
- cost savings of just over [X] on Ethernet equipment; and
- assumed minimal efficiency savings on the remaining capex.

²⁵⁶ See our asset price assumptions in Annex 32.

²⁵⁷ These assets are recorded in sector DK. See page 336 of the BT 2015 AMD. Assets within Sector DK are not re-valued.

²⁵⁸ BT also notes the efficiency of its capital investment program. See paragraph A29.218.

²⁵⁹ See Annex 32.

²⁶⁰ For example growth capex is calculated with respect to GRCs. Duct assets account for a reasonable proportion of the GRCs of assets used to provide Ethernet services.

²⁶¹ We constructed the weights using information on capital expenditure by component from BT's Additional Financial Information Schedule AFI3. This provided a breakdown of capex by component which we then summarised by capitalised pay, Ethernet equipment and Other. We then weighted the component data together using capex forecasts by component from the 2016 LLCC model.

A29.262 The result of applying the above assumptions produces estimates in the range 3.2% to 5.0%, with the lower numbers reflecting historical data.

A29.263 Our decision is in the middle of this range. This reflects our views on the robustness of the data and achieving the right balance between setting a target that is challenging with one that BT can exceed. Consistent with our position in previous charge controls, our intention is not to set a target that will be easy to meet, nor to set a target that would be impossible to outperform. We believe our capex efficiency target of 4% for Ethernet services reflects a reasonable target in the light of the evidence available to us.

Annex 30

Cost of capital

Introduction and summary

- A30.1 When setting a charge control, we are concerned with estimating the weighted average cost of capital (WACC) on a forward looking basis. Since we typically set charge controls on a glide path to forecast costs, we are concerned with estimating the WACC for the final year of the charge control (in this case 2018/19).
- A30.2 The cost model for the leased lines charge control is based on projections of nominal costs without explicit modelling of tax, therefore we require a forecast of the pre-tax nominal WACC.
- A30.3 The WACC combines the cost of funding from debt and equity according to the gearing, i.e. the value of outstanding debt relative to total financing (i.e. value of debt and equity combined). For gearing, g , and corporate tax rate, t , the pre-tax WACC is defined as follows (since debt finance benefits from a tax shield which equity does not):

$$WACC = \frac{K_e * (1 - g)}{1 - t} + K_d * g$$

- A30.4 In this formula, we calculate the cost of equity, K_e , using the Capital Asset Pricing Model (CAPM), such that the cost of equity is a function of the risk-free rate (RFR), the expected return on the equity market as a whole above the risk-free rate (i.e. the equity risk premium, or ERP) and the systematic risk of the company (i.e. equity beta, β_{equity}): $K_e = RFR + ERP * \beta_{equity}$.
- A30.5 Our approach to calculating the cost of debt combines the same RFR assumption as used to estimate the cost of equity and adds to the RFR a debt premium (i.e. the firm's corporate debt rate above benchmark risk-free assets), such that: $K_d = RFR + dp$.
- A30.6 Following the June 2015 LLCC Consultation, we have reviewed stakeholder responses and updated the WACC parameter values. The main changes from the consultation relate to the asset beta estimates for Openreach copper access and Other UK telecoms. Other changes to the WACC reflect more routine parameter updates in light of available data. The net result of these changes is to decrease the pre-tax nominal WACC applied to leased lines from 10.1% in the June 2015 LLCC Consultation to 9.8% now.
- A30.7 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. Since 2005, we have estimated the WACC for BT Group plc (BT Group) and undertaken a two-way disaggregation; splitting the BT Group WACC into a WACC for Openreach copper access and a WACC for the rest of BT (RoBT). Since our decision to disaggregate the WACC for BT, the RoBT WACC has been applied to the leased lines business: with a pre-tax nominal rate of 11.0% in the 2009 LLCC statement and 9.9% in the 2013 LLCC statement.
- A30.8 In our June 2015 LLCC Consultation we proposed a three-way disaggregation of the BT Group WACC because our traditional two-way disaggregation appeared to

produce a value for the RoBT which was too high based on our understanding of i) the likely risk facing leased lines and ii) a comparison with comparator telecoms companies. We separated the RoBT WACC into a WACC appropriate for “Other UK telecoms” services (which we applied to leased lines) and a new RoBT WACC which primarily included BT’s Global Services division. Having reviewed and updated the data for BT and comparator companies and after reflecting on stakeholder responses to the June 2015 LLCC Consultation, we have decided to continue with a three-way disaggregation of the BT Group WACC, with the Other UK telecoms WACC applied to leased lines.

A30.9 Our calculations of the WACC for BT Group, Openreach copper access, Other UK telecoms and the RoBT for this statement are shown in Table A30.1 below.

Table A30.1: BT WACC, March 2016 Statement

WACC component	BT Group	Openreach copper	Other UK telecoms (applied to leased lines)	RoBT	Source
Real risk-free rate (RFR)	1.0%	1.0%	1.0%	1.0%	Ofcom estimate
RPI inflation	3.3%	3.3%	3.3%	3.3%	HM Treasury
Nominal risk-free rate (Nominal RFR)	4.3%	4.3%	4.3%	4.3%	$= (1 + \text{RFR}) * (1 + \text{inflation}) - 1$
Nominal Equity Risk Premium (ERP)	5.3%	5.3%	5.3%	5.3%	Ofcom estimate
Debt beta (β_{debt})	0.10	0.10	0.10	0.10	Ofcom estimate
Asset beta (β_{asset})	0.72	0.55	0.70	1.08	NERA estimate for BT Group, Ofcom estimate for rest based on comparators from NERA Final Report
Asset beta weight	100%	25%	60%	15%	Ofcom estimate
Gearing (forward looking) (g)	30%	30%	30%	30%	Ofcom estimate
Equity Beta (β_{equity})	0.99	0.74	0.96	1.50	$= \frac{\beta_{\text{asset}} - \beta_{\text{debt}} * g}{1 - g}$
Cost of equity (post-tax) (K_e)	9.6%	8.3%	9.4%	12.3%	$= \text{Nominal RFR} + \beta_{\text{equity}} * \text{ERP}$
Cost of equity (pre-tax)	11.8%	10.2%	11.6%	15.2%	$= K_e / (1 - t)$

Debt premium (dp)	1.2%	1.1%	1.2%	1.5%	Ofcom estimate
Corporate tax rate (t)	19%	19%	19%	19%	HMRC
Cost of debt (pre-tax)	5.5%	5.4%	5.5%	5.8%	= RFR + dp
WACC (pre-tax nominal)	9.9%	8.8%	9.8%	12.4%	$= \frac{K_e * (1 - g)}{1 - t} + K_d * g$

Source: Ofcom

A30.10 The parameter values underpinning the three-way disaggregation used in the June 2015 LLCC Consultation are shown in Table A30.2 below.

Table A30.2: BT WACC, June 2015 LLCC Consultation

WACC component	BT Group	Openreach copper	Other UK telecoms (as applied to leased lines in the June 2015 LLCC Consultation)	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%
Nominal 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

A30.11 In the remainder of this annex we first give an overview of stakeholder responses to the June 2015 LLCC Consultation before explaining our approach to setting each of the WACC parameters.

Overview of stakeholder responses

Stakeholder responses

- A30.12 Below we summarise the high-level position of each stakeholder on the WACC.
- A30.13 BT argued that we should continue with a two-way disaggregation and commissioned a report from FTI to support this position. That report also addressed various other parameter assumptions underpinning the WACC, which either estimated the same parameter values we used in the June 2015 LLCC Consultation, or estimated higher values (most notably for the cost of debt). The overall result was that FTI estimated the pre-tax nominal WACC to be applied to BT's leased lines business to be 10.6% (from the RoBT WACC derived from a two-way disaggregation). We deal with BT's arguments under the WACC parameter that they relate to later in this annex.
- A30.14 Vodafone, TalkTalk, Sky, GTC and [X] argued that we had calculated too high a value for the WACC. Vodafone, TalkTalk and Sky supported further disaggregation for the WACC that would apply to BT's leased lines business. However, they argued that the asset beta applied to BT's leased lines business should be lower, for example, by further separating out the lines of business from the three-way disaggregation that we consulted on. GTC's arguments were primarily concerned with the appropriate comparators to use for BT's different lines of business. We deal with these arguments from Vodafone, TalkTalk, Sky and GTC in the round when we address beta disaggregation later in this annex.
- A30.15 [X] sought to compare the calculated WACC for BT with what it argued were "sub-4%" WACCs for regulated water utilities, as evidence for how the estimated WACC for BT was "wholly inefficient".²⁶² [X] went on to argue that Ofcom should estimate the WACC for BT based on a hypothetical entity "...which only had the monopoly assets in question, built from scratch and efficiently funded."²⁶³ In [X] view, this would produce a substantially lower WACC than the 10.1% consulted on.
- A30.16 TalkTalk said that Ofcom's estimation of a WACC in the final year of the charge control (2018/19), "...can lead to systematic over- or under-recovery of costs over the course of the three year charge control period. Effectively, the final year estimated WACC is applied to each year in the charge control period even if the estimated WACC in year one or two is lower (or higher) as a result, say, of inflation being lower (or higher) than in year 3. Ofcom's approach introduces the risk of significant regulatory error".²⁶⁴
- A30.17 TalkTalk considered that this issue could be resolved by either estimating an average WACC over the charge control period (for example, by including average inflation and tax rates over the period in the WACC calculation) or estimating a WACC for each year of the control and setting a different X in each year.²⁶⁵

²⁶² [X].

²⁶³ [X].

²⁶⁴ TalkTalk, response to the June 2015 LLCC Consultation, paragraph 1.4.

²⁶⁵ TalkTalk response to the June 2015 LLCC Consultation, paragraphs 1.5 and 1.7.

Our analysis and conclusion

A30.18 We address below the following submissions on our overall approach (i) whether we should be concerned with the final year of the charge control; (ii) the comparison with water utilities and (iii) the use of an entirely hypothetical entity.

WACC for the final year of the control

A30.19 TalkTalk is correct to note that our focus is on estimating the WACC in 2018/19, the final year of the charge control. This is consistent with our approach to setting the charge control under which the value of X (in CPI-X) is derived in order to close the forecast gap between costs and revenues (taking any starting charge adjustments into account) in the final year of the control.

A30.20 Under this glide path approach we do not seek to close the gap between forecast costs and revenues in each year of the control, but rather we seek to close the forecast gap by the end of the control. We explain our general preference for this glide path approach, and the underlying efficiency properties of it, in Volume II, Section 4.

A30.21 TalkTalk argues that under our approach “effectively the final year estimated WACC is applied to each year in the control period”. However, this is not correct because we apply a glide path approach and have not set the CPI-X cap to align with forecast costs in each and every year of the control.

Comparison with the WACC in other sectors such as water

A30.22 When comparing our estimated BT WACC with the WACCs calculated by other UK regulators in different sectors it is important to ensure that the WACCs are calculated on a comparable basis; in particular, whether the WACCs are in real or nominal terms and whether they are on a pre-tax or on a vanilla basis.²⁶⁶ For example, the ‘sub-4%’ water utility WACC referenced by [3<] is a real vanilla WACC, while the WACC we present (and use) for these BT charge controls is a pre-tax nominal WACC. This means that our WACC will be higher by virtue of the fact it is estimated in nominal terms and because the cost of equity is uplifted (for corporate tax) since our charge controls do not otherwise model the (implicit) corporate tax liability of the relevant lines of business.

A30.23 Indeed, taking our parameter estimates for Other UK telecoms on a three-way disaggregation (see Table A30.1 above), the vanilla WACC in real terms (adjusted for RPI), would be 4.8%. For Openreach copper access, the real vanilla WACC is 4.0%.

A30.24 From this it can be seen that the resulting like-for-like WACC for water utilities (at just below 4% on a real vanilla basis) is only slightly lower than the WACC determined by us in this statement. A priori, we would expect the WACC for a telecoms business to be somewhat above that of a water utility, not least since the systematic risk appears higher. As shown in Table 3.2 of the final NERA report the asset beta of water utilities like Severn Trent, Pennon and United Utilities averages 0.43 (based on daily returns over 2 years regressed against the FTSE All Share

²⁶⁶ The vanilla WACC is estimated by reference to the post-tax cost of equity and the pre-tax cost of debt, while the pre-tax WACC is estimated by reference to the pre-tax cost of equity and debt.

and based on a debt beta of 0.1).²⁶⁷ In contrast, UK telecoms companies have asset betas averaging 0.66 calculated on the same basis (see table 3.2 of the final NERA report).

Creation of a hypothetical regulated entity

- A30.25 We do not consider that it would be appropriate to create a hypothetical regulated entity which “builds and operates such a monopoly utility asset” as [3<] has suggested.
- A30.26 It is unclear whether the “assets” that [3<] envisages include only the BT copper and duct network (which it refers to when comparing with water utilities), or the leased lines assets which are the subject of this charge control. In our view the relevant assets are leased lines and in evaluating systematic risk it is the cash flows from the use in question that are relevant, not the physical assets per se. Therefore, in so far as there are elements of commonality between the physical assets in different sectors (e.g. nationally deployed civil infrastructure), this does not determine the systematic risk inherent in the services delivered over that infrastructure.

Risk-free rate and equity risk premium

June 2015 LLCC Consultation

- A30.27 In the June 2015 LLCC Consultation we proposed a real RFR of 1.0% and an ERP of 5.3%, as used in the March 2015 MCT Statement.²⁶⁸ Combining these estimates for the RFR and the ERP we produced a total market return (TMR) for equities of 6.3%.²⁶⁹ We said we would review whether these economy-wide parameters remained appropriate for this statement in light of market data.

Stakeholder responses

- A30.28 FTI, on behalf of BT noted that the real RFR proposed fell within the range of regulatory precedents saying that “recent NRA [national regulatory authorities] and CMA decisions have generally used a real RFR that has been at or above 1%”.²⁷⁰ However, given recent regulatory decisions and rising real yields on Government bonds, FTI thought it “may be considered to be at the lower end for a forward looking rate”.²⁷¹ FTI noted that “Ofcom’s slightly lower RFR is mostly balanced by a slightly higher ERP”²⁷² and the resulting TMR of 6.3% was only slightly below the regulatory precedent average, which FTI considered to be 6.4% based on regulatory decisions between December 2012 and February 2015.²⁷³

²⁶⁷ These assumptions are further explained under the asset beta and debt sections of this annex.

²⁶⁸ Annex 10, Ofcom, *Mobile call termination market review 2015-18*, Statement, 17 March 2015, http://stakeholders.ofcom.org.uk/binaries/consultations/mobile-call-termination-14/statement/Annexes_7-13_final.pdf

²⁶⁹ As explained further below, this TMR of 6.3% combines a real RFR of 1.0% and a nominal ERP of 5.3%. A real ERP would be closer to 5.1%, which would make our real TMR 6.1% rather than 6.3% as reported in the 2015 MCT Statement.

²⁷⁰ Annex J, BT response to the June 2015 LLCC Consultation, paragraph 3.6 (FTI report).

²⁷¹ FTI report, paragraph 3.8.

²⁷² FTI report, paragraph 3.9.

²⁷³ See Table 4 on page 15, FTI report.

A30.29 Sky noted that in the March 2015 MCT Statement we reduced the RFR from 1.3% to 1% and increased the ERP from 5% to 5.3%, thus maintaining a constant TMR at 6.3%. Sky did not disagree with a stable TMR in principle, but noted that the impact of this approach is that it can ignore permanent reductions in the RFR that lead to reductions in the TMR. Sky argued that a stable TMR approach implied that if spot rates on gilts increase in the short term, such increases should not lead to immediate increases in Ofcom's estimate of the TMR.

A30.30 TalkTalk considered that the evidence did not support a RFR of 1% and that a more justifiable estimate would be no higher than 0% for 2018/19.²⁷⁴ In support of this TalkTalk said:

- based on yields on index-linked gilts the current real RFR was approximately -1% and that even if there were factors (such as the removal of quantitative easing) that may result in the real RFR increasing over the next 3 to 4 years, the evidence did not support an assumption of 1%²⁷⁵;
- the only way in which the gilt return evidence would support a 1% real RFR assumption would be to use very long averages of 15 years or more, and thus take in much of the pre-crash period. TalkTalk did not think that such an assumption was sound²⁷⁶; and
- the implied yield on five and ten year gilts issued in three years' time was -0.9% (based on data to 30 January 2015 published in the March 2015 MCT Statement).²⁷⁷

A30.31 TalkTalk considered that an ERP of 5.3% was "within Ofcom's range of discretion".²⁷⁸ However, it considered that it would be difficult to justify an ERP above this level, as it would push the ERP well above the long-term average of 5% cited by Ofcom in the March 2015 MCT Statement.²⁷⁹ TalkTalk thought that we should reduce the real RFR, maintain the ERP and thus reduce the TMR.

A30.32 Vodafone considered that our TMR estimate of 6.3% was reasonable given recent CMA decisions.²⁸⁰

Our analysis

Real RFR

A30.33 We have updated our analysis of historical yields on index-linked gilts and forward rates on those gilts. We have also considered other recent regulatory decisions. We have decided to maintain our estimate of the real RFR at 1.0% for this statement.

²⁷⁴ TalkTalk response to the June 2015 LLCC Consultation, paragraph 1.23.

<http://stakeholders.ofcom.org.uk/binaries/consultations/llcc-dark-fibre/responses/TalkTalk.pdf>

²⁷⁵ TalkTalk response to the June 2015 LLCC Consultation, paragraph 1.14.

²⁷⁶ TalkTalk response to the June 2015 LLCC Consultation, paragraph 1.17.

²⁷⁷ TalkTalk response to the June 2015 LLCC Consultation, paragraph 1.20.

²⁷⁸ TalkTalk response to the June 2015 LLCC Consultation, paragraph 1.27.

²⁷⁹ See paragraph A10.51 of the 2015 MCT Statement.

²⁸⁰ Vodafone response to the June 2015 LLCC Consultation, paragraph 6.28.

Yields on index-linked gilts

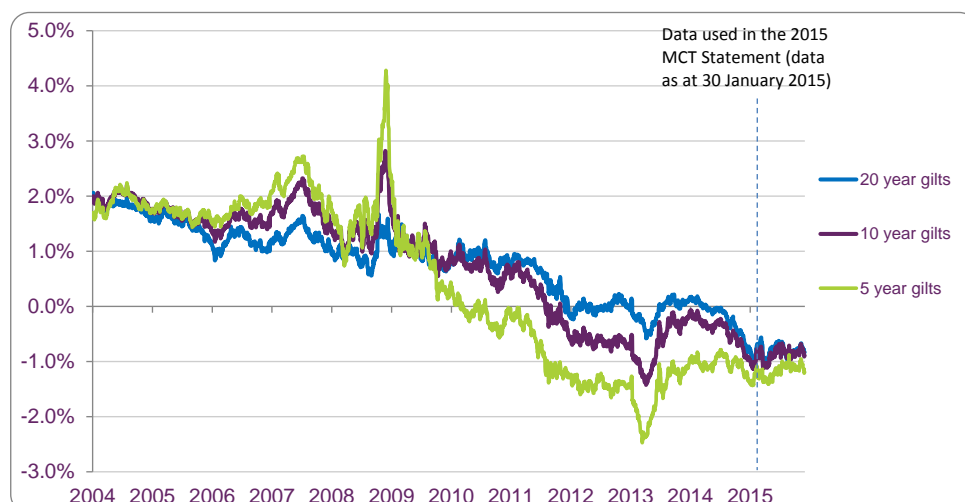
A30.34 We have updated our analysis of movements in historical averages of yields on index-linked gilts to 30 November 2015. Table A30.3 compares the latest data to that presented in the March 2015 MCT Statement (which used data to 30 January 2015) for both five- and ten-year gilts. Yields on five- and ten-year index-linked gilts remain negative over averaging periods of five years or less and do not approach yields of around 1% until we reach a 15 year averaging period.

Table A30.3: Yields on index-linked gilts

Averaging period	Five year gilts		Ten year gilts	
Data as at:	30 Jan 2015 MCT Statement	30 Nov 2015 This Statement	30 Jan 2015 MCT Statement	30 Nov 2015 This Statement
Spot rate	-1.2	-1.2	-1.0	-0.9
1 month	-1.4	-1.1	-1.1	-0.8
3 months	-1.3	-1.1	-0.9	-0.8
1 year	-1.1	-1.2	-0.5	-0.9
2 years	-1.3	-1.1	-0.6	-0.6
5 years	-1.0	-1.2	-0.2	-0.5
10 years	0.3	0.1	0.7	0.4
15 years	1.0	0.8	1.2	1.0
20 years	1.5	1.3	1.6	1.4

Source: Ofcom analysis of Bank of England data

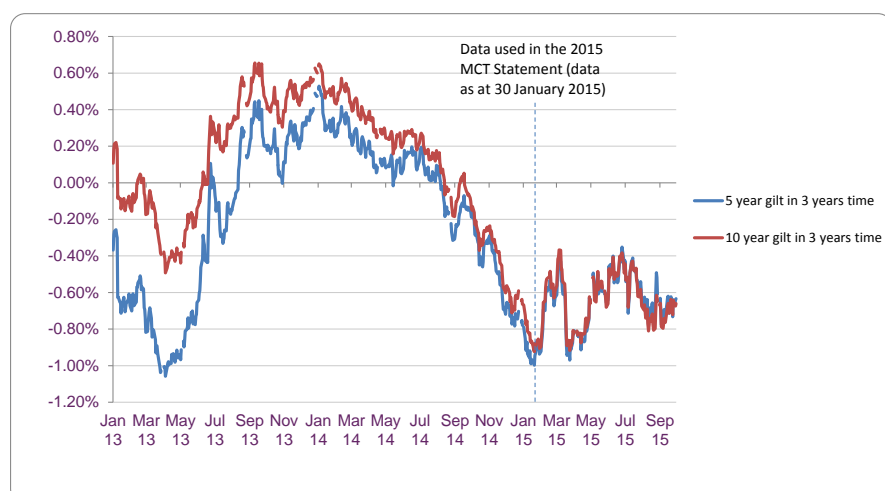
A30.35 Figure A30.1 below illustrates that spot yields on five, ten and 20 year index-linked gilts have not changed significantly since the January 2015 data considered in the March 2015 MCT Statement.

Figure A30.1: Spot rates on five, ten and twenty year index-linked gilts

Source: Bank of England, Ofcom analysis. Data as at 30 November 2015.

Forward rates on index-linked gilts

A30.36 Forward rates can indicate what investors expect to happen to real gilt rates in the future. Figure A30.2 below illustrates that while forward rates on five and ten year gilts taken out in three years' time were around -0.9% at the time of the March 2015 MCT Statement, they have increased slightly to around -0.7%.²⁸¹

Figure A30.2: Forward rates on 5 and 10 year gilts taken out in three years' time

Source: Bank of England, Ofcom analysis. Data as at 30 November 2015.

²⁸¹ The forward rates represent the implied future yield on an investment in a five- or ten-year index-linked gilt made in three years' time. They are calculated using the following formula:

$$f_{t,T} = \left[\frac{(1+r_T)^T}{(1+r_t)^t} \right]^{\frac{1}{T-t}} - 1$$

where for the five-year gilt calculation, r_t denotes the annual yield in the first three years, so $t=3$ and r_T denotes the annual yield in the first eight years, so $T=8$ in this example. In other words, for the forward five-year gilt calculation we are solving for the future yield required to equalise the difference between the yields on a gilt taken out today with three years to maturity (the proceeds of which can then be reinvested at a future yield for a further five years) and the yield on a gilt taken out today with eight years to maturity.

Long run real returns on treasury bills and gilts

A30.37 Using 116 years of data from 1900 to 2015 the Credit Suisse Global Investment Sourcebook 2016 (2016 Sourcebook) calculates that the long run real return on treasury bills is 1.2% and on gilts it is 2.6%.²⁸² The CMA noted in its 2014 NIE Determination that treasury bills, being short term government instruments, may represent a better measure of the real RFR than longer term government gilts, though the CMA considered it doubtful that bills would be free of inflation risk.²⁸³

Recent regulatory decisions on the real RFR

A30.38 Table A30.4 summarises the real RFR used in other recent regulatory decisions. The table also reports the real ERP and real total market return (TMR, equal to the real RFR plus the real ERP) since these are often considered together. This is because there may be an inverse relationship between the real RFR and ERP such that the TMR is more stable.²⁸⁴

A30.39 The CMA said in its 2014 NIE Determination that “historically, the market return has tended to be less volatile than the ERP (as measured, for example, by the ratio of standard deviation to mean) and there is some evidence of the ERP being negatively correlated with treasury bill rates over the short term”.²⁸⁵

Table A30.4: Recent regulatory decisions on the real RFR, ERP and TMR

Organisation	Date (control period)	Real RFR	ERP	TMR	RPI
CMA (NIE)	Mar 14 (Jan 13 – Sep 17)	1 – 1.5%	4 – 5%	5 – 6.5%	3.25%
CAA	Jun 14 (2015 – 2019)	0.75%	5.5%	6.25%	2.8%
OFGEM	Nov 14 (8Y March 2023)	1.6%	5.25%	6.85%	3.1%
OFWAT	Dec 14 (5Y March 2020)	1.25%	5.5%	6.75%	2.8%
CMA (BW)	Oct 15 (5Y Mar 2020)	1.25%	5.25%	6.5%	2.5% - 2.7%

²⁸² Table 70, page 180, 2016 Sourcebook. This is the arithmetic average.

²⁸³ See paragraph 13.122, page 13-23, of the 2014 NIE Determination. Noting that investors in some countries have historically experienced negative real returns on bills (e.g. Germany), the 2016 Sourcebook says that “although we can generally regard short-dated government bills as risk-free, in cases of hyperinflation, this ceases to be the case, and bills become riskier than equities” (page 14).

²⁸⁴ The 2003 Smithers & Co report recommended that the cost of equity should be derived from estimates of the TMR, with any changes in the real RFR or ERP offsetting each other. See pages 48 and 49, Smithers & Co, A study into certain aspects of the cost of capital for the regulated utilities in the UK, 13 February 2003 ('2003 Smithers & Co report').

<http://www.ofcom.org.uk/static/archive/oftel/publications/pricing/2003/cofk0203.htm>

²⁸⁵ Paragraph 13.148, page 13-30, 2014 NIE Determination, https://assets.digital.cabinet-office.gov.uk/media/535a5768ed915d0fdb000003/NIE_Final_determination.pdf

Source: CAA: page 10, NERL RP2²⁸⁶, Ofgem, ED1²⁸⁷, Ofwat, Page 41 Price control 2015-20 (A7 risk and reward)²⁸⁸. CMA Paragraph 13.23 and 13.161 2014 NIE Determination and paragraph 10.62, 10.117, 10.186 2015 Bristol Water Decision

A30.40 In relation to the RFR, the CMA's Bristol Water 2015 decision explained that it had "analysed the market evidence for the RFR based on long- and short-dated index-linked and nominal gilt yields. This evidence indicated that gilt yields remained very low, often around 0% These market conditions have been similar for the past three years ... and we put weight on regulatory precedent on the RFR from this period, in particular the CC/CMA determination in NIE 2014. This would support an RFR of between 1 and 1.5%. We therefore found that a point estimate rate of 1.25% ... was an appropriate figure for the RFR".²⁸⁹ The CMA concluded that a point estimate of 1.25% was appropriate to use in the Bristol Water determination.

Conclusion on the real RFR

A30.41 We continue to believe that caution is required in interpreting the evidence available. We put more weight on longer run yields for index-linked gilts because we consider it difficult to conclude that the real RFR in the economy is negative and taking a longer-run view is consistent with our established methodology. However, we note that the persistent negative rates have continued to reduce the longer run average yields for index-linked gilts.

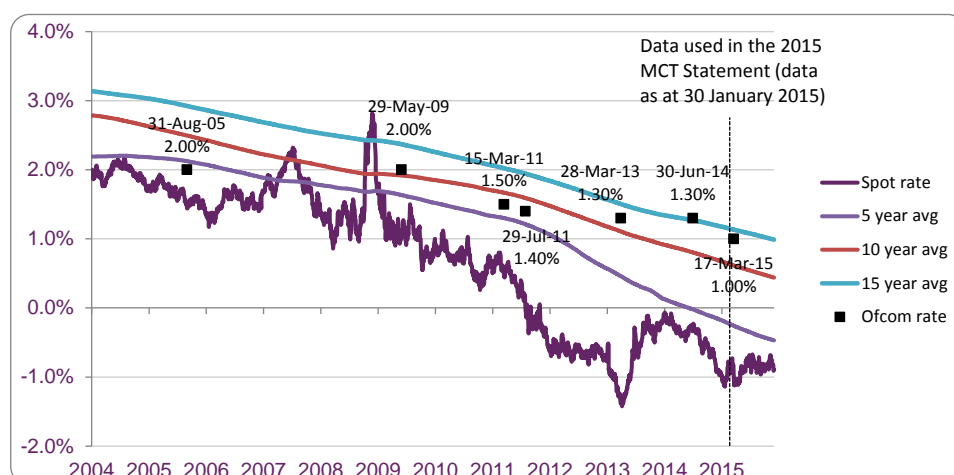
A30.42 In setting the real RFR in previous decisions we have tried to strike a balance between longer term average yields and current yields on gilts. Figure A30.3 illustrates this by showing Ofcom's decisions on the real RFR compared to yields on ten-year gilts over different averaging periods – spot rates, five year averages, ten year averages and 15 year averages. As can be seen from this figure, our real RFR assumptions have more closely followed longer term averages of gilt yields. We have placed less weight on spot yields which may not be typical for the forward looking period for which the WACC is set and may not reflect the long-term features underlying the return required by investors in a risk-less asset.

²⁸⁶ FAB, Performance Plan UK-Ireland FAB, Second reference period (2015-2019), June 2014. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/325428/uk-ireland-rp2-performance-plan.pdf

²⁸⁷ OFGEM, RIIO-ED1: Final determinations for the slow-track electricity distribution companies, 28 November 2014. <https://www.ofgem.gov.uk/ofgem-publications/91564/riio-ed1finaldeterminationoverview.pdf>

²⁸⁸ OFWAT, Setting price controls for 2015-2020, Final price control determination notice: policy chapter A7 – risk and reward, December 2014. http://www.ofwat.gov.uk/pricereview/pr14/det_pr20141212riskreward.pdf

²⁸⁹ Paragraphs 10.170 – 10.173, Bristol Water plc A reference under section 12(3)(a) of the Water Industry Act 1991 Report Presented to Ofwat: 6 October 2015

Figure A30.3: Yields on 10-year gilts and Ofcom decisions on real RFR

Source: Bank of England, Ofcom analysis. Data as at 30 November 2015.

A30.43 Since we reduced our estimate of the RFR to 1% last year, it appears that spot rates have stabilised, although long-run averages have continued to decline (picking up the overall decline in gilt yields since the financial crisis). Since we consider that the RFR should reflect the long-run yield on a risk-less asset and given the horizon considered in estimating equity market returns in particular, we have decided to leave our estimate of the RFR at 1%, which we note is within the range, but towards the lower-end, of estimates by other UK economic regulators.

A30.44 Combined with our RPI inflation forecast for 2018/19 of 3.3% (see below), the nominal RFR is therefore 4.3%.

TMR

A30.45 Estimating the ERP directly is difficult since it depends on the weight placed on different sources of evidence, none of which will perfectly capture what is not a directly observable variable; the expected ERP. While the TMR is also not directly observable, the TMR has been historically less volatile than the ERP.²⁹⁰ We have considered historical ex-post and historical ex-ante estimates of the TMR.

Historical ex-post estimates of the TMR

A30.46 Historical ex-post approaches assume that the average realised real TMR is a good proxy for the expected real TMR. Datasets from the 2016 Sourcebook and 2015 Barclays Equity Gilt Study (2015 Barclays EGS) are the main source of evidence for historical returns.

A30.47 Table A30.5 shows arithmetic average real returns over the period 1900 to 2015 from the 2016 Sourcebook and 1900 to 2014 from the 2015 Barclays EGS, assuming different holding periods for equity.

²⁹⁰ From Table 70 of the 2016 Sourcebook the ratio of standard deviation to arithmetic mean for the nominal TMR is 1.9; lower than the equivalent ratio for the nominal ERP calculated for equities against bonds (3.4) and equities against bills (3.3).

Table A30.5: Arithmetic average real return on equity, 1900-2014

Holding period:	1 year	2 year	5 year	10 year	20 year
2016 Sourcebook	7.2%	7.2%	7.0%	6.9%	7.0%
2015 Barclays EGS	6.9%	6.8%	6.5%	6.4%	6.4%

Source: Ofcom calculations based on Table 70 of the 2016 Sourcebook and page 187 of the 2015 Barclays EGS. The averages shown are averages of rolling averages – e.g. for a 10 year holding period the average shown is the average annual return for 10-year holding periods for each year from 1909 to 2014.

A30.48 Table A30.5 indicates that the real historical ex-post average annual return on equity for holding periods of between one and twenty years lies somewhere between 6.4% to 7.2%, with returns falling the longer the holding period.

Historical ex-ante estimates of the TMR

A30.49 In the March 2015 MCT Statement we considered two historical ex-ante approaches to estimating the real TMR.

A30.50 First, we considered Fama and French's approach of estimating the real TMR from the sum of average real dividend yields and the average real rate of dividend growth.²⁹¹ Data from the 2015 Barclays EGS suggests that the average real dividend yield has been 4.5% over the period 1900 to 2014 while the average real rate of dividend growth was about 1%. This suggests a long run real TMR of around 5.5%.²⁹²

A30.51 Second, we considered work by Dimson, Marsh and Staunton (DMS) in the 2016 Sourcebook who tried to infer what returns investors may have been expecting in the past by separating the historical equity premium into elements that correspond to investor expectations and those that relate to non-repeatable good or bad luck. DMS takes into account dividend income, real dividend growth, expansion of valuation ratios and changes in the real exchange rate.²⁹³ DMS infer that globally diversified investors currently expect an arithmetic average ERP over treasury bills of 4.5% to 5%.²⁹⁴ Given the average long run real return on treasury bills (which is the DMS preferred measure of risk free returns²⁹⁵) is 1.2% (see paragraph A30.37) this implies an expected real TMR of 5.7% to 6.2%.

Implications for the TMR

A30.52 In the June 2015 LLCC Consultation we proposed to use the same TMR as we used in the March 2015 MCT Statement, namely 6.3% (which sits within the ranges set out above). The TMR of 6.3% that we presented was made up of a real RFR of

²⁹¹ Fama, E. F. and French, K. R., 'The Equity Premium', Journal of Finance Vol. LVII, No. 2, April 2002.

²⁹² In its 2014 NIE Determination the CMA noted that current dividend yields were below the historical average which might suggest that expected returns are currently lower than 5.5%. See paragraph 13.144.

²⁹³ See for example pages 29 to 34 of the 2016 Sourcebook.

²⁹⁴ Page 34 of the 2016 Sourcebook.

²⁹⁵ See page 24 of the 2016 Sourcebook

1.0% and an ERP of 5.3%. We considered that this ERP of 5.3% appeared plausible against other direct estimates of the ERP.

- A30.53 Empirical studies point to an ERP around 5% while recent regulatory decisions have used a real ERP around 5.25% to 5.5%.²⁹⁶ In the March 2015 MCT Statement, we considered that an ERP of 5.3% appeared plausible against this range of estimates.
- A30.54 Having reviewed the basis of comparison, we consider that the TMR of 6.3% proposed in the June 2015 LLCC Consultation should more accurately be read as a real TMR of 6.1%. This is because, in our WACC calculation, the 5.3% ERP is used as the wedge between nominal equity returns and nominal returns on riskless assets, consistent with the CAPM formula. Therefore, because Ofcom's calculations of the WACC have used a nominal ERP (e.g. in the March 2015 MCT Statement and June 2014 FAMR Statement), we should have combined the nominal ERP with the nominal RFR to produce a nominal TMR, from which we could then adjust for inflation in a consistent manner (i.e. consistent with the Fisher equation). Based on the assumptions underpinning the March 2015 MCT Statement, the nominal TMR was 9.6%, which corresponds to a real TMR of 6.1%.²⁹⁷
- A30.55 A real TMR of 6.1% is within the plausible range of empirical studies presented above. In the March 2015 MCT Statement, we considered 6.3% to be a reasonable estimate, but note that the range is relatively wide and with significant uncertainty around these parameter estimates.²⁹⁸
- A30.56 Given this, we have also considered how our nominal TMR compares to other recent regulatory decisions and the how the implied ERP compares to empirical evidence and other regulatory decisions.
- A30.57 A real TMR of 6.1% implies a nominal TMR of 9.6% (based on 3.3% inflation). This is the same as in the March 2015 MCT Statement because we have the same inflation assumption. A nominal TMR of 9.6% is slightly above that used in the CMA's 2015 Bristol Water decision but below that used by Ofgem and the CAA in their most recent decisions. From Table A30.4, the CMA's assumed real TMR of 6.5% coupled with an assumed RPI inflation of 2.7%²⁹⁹ gives a nominal TMR of 9.4%, while for Ofgem and the CAA the respective nominal TMRs are 10.2% and 9.2%.³⁰⁰

²⁹⁶ See Table A30.4 which shows the last four regulatory decisions have used an ERP of 5.25% or 5.5%.

²⁹⁷ The nominal TMR is defined as $\text{nominal TMR} = (1 + \text{real RFR} + \text{real ERP}) \times (1 + \text{inflation}) - 1$. This can be re-arranged to: $\text{real ERP} = (1 + \text{nominal TMR}) / (1 + \text{inflation}) - 1 - \text{real RFR}$. Based on the RFR and ERP assumptions before Ofcom rebalanced the RFR and ERP, the nominal RFR was 4.6% (based on 1.3% real RFR, 3.3% RPI inflation and combined using the Fisher equation); the nominal ERP was 5.0%, giving a nominal TMR of 9.6%. The correct real TMR before rebalancing would therefore be as follows: $\text{real TMR} = (1.096) / (1.033) - 1 = 6.1\%$. Deducting the real RFR of 1.3% gives a real ERP before rebalancing of 4.8% (not 5% as interpreted in the 2015 MCT Statement). After revising the real RFR down from 1.3% to 1% and deducting this from the correct real TMR, gives a rebalanced real ERP of $5.1\% = 6.1\% - 1.0\%$.

²⁹⁸ For example, the 2016 Sourcebook reports a standard deviation of 19.7% around the real historical return on equity of 7.2% (for one-year holding periods).

²⁹⁹ Paragraph 10.62, CMA Bristol Water Decision.

³⁰⁰ From Table A30.4 Ofgem's November 2014 decision used a real TMR of 6.85% and an inflation assumption of 3.1%. CAA's June 2014 decision used a real TMR of 6.25% and an inflation assumption of 2.8%.

A30.58 A real TMR of 6.1% also implies a real ERP of 5.1% (when deducting the real RFR of 1%). Before concluding on the TMR and ERP, we now turn to evidence on the ERP.

ERP

A30.59 In order to estimate the ERP we have looked at evidence from:

- historical premia of UK equities over UK gilts;
- forward looking estimates of the ERP; and
- regulatory precedents.

Historical premia of UK equities over gilts and treasury bills

A30.60 The 2016 Sourcebook reports that the average (arithmetic) equity premium over bonds for the UK between 1900 and 2015 was 5.0%.³⁰¹ The average equity premium over treasury bills was 6.0% (arithmetic mean) for the same period.

A30.61 The Barclays 2015 EGS indicates that the average (arithmetic mean) premium of equities over bonds for the UK between 1900 and 2014 was 5.1%.³⁰² The average equity premium over treasury bills was 6.1% (arithmetic mean) for the same period.³⁰³

A30.62 These sources suggest that, when rounded, the nominal ERP is between 5% and 6% depending on whether the equity premium is measured relative to Government gilts (in which case it is around 5%) or treasury bills (in which case it is around 6%). The corresponding figure is slightly less in real terms. Taking the long-run view of inflation in the 2016 Sourcebook consistent with the period of estimation for equity returns (which gives long-run inflation at 3.9%³⁰⁴), the range for the real ERP would be 4.8% (against gilts) to 5.9% against treasury bills.

Forward looking estimates of the ERP (surveys and the dividend growth model)

A30.63 The 2015 survey of academics and investment professionals by Fernandez et al³⁰⁵ gives a mean ERP of 5.2% and median of 5.0%.

A30.64 We place limited weight on survey evidence. This is for much the same reason as articulated by the CMA, which said “the results of such surveys tend to depend on

³⁰¹ Table 70, page 180, 2016 Sourcebook.

³⁰² The arithmetic average nominal return on equities between 1900 and 2014 is 11.0% using the table on page 187 of the Barclays 2015 EGS. The arithmetic average nominal return on UK gilts in the same period was 5.9% using the table on page 189. The difference (premium of equities over gilts) is therefore 5.1%.

³⁰³ The arithmetic average nominal return on equities between 1900 and 2014 was 11.0% using the table on page 187 of the Barclays 2015 EGS. The arithmetic average nominal return on treasury bills in the same period was 4.8% using the table on page 191 of the Barclays 2015 EGS. The difference is therefore 6.1% (allowing for rounding).

³⁰⁴ Table 70, page 180, 2016 Sourcebook. Long-run inflation is 4.1% calculated using the Barclays 2015 EGS.

³⁰⁵ Fernandez, P., Ortiz, A., Acin, I.F., 'Discount Rate (Risk-Free Rate and Market Risk Premium) used for 41 countries in 2015: a survey', 19 November 2015. The survey was sent to “finance and economic professors, analysts and managers” (page 2).

the identity and outlook of the respondents and how they interpret the questions being asked. Some surveys do not clarify the time frame over which the parameters are to be estimated (the long-term equilibrium ERP or a shorter-term estimate); whether an arithmetic or geometric averaging approach should be used; or whether the ERP is over bonds or bills or some other instrument. In this report we have preferred to consider the underlying data on which survey respondents presumably base their views.”³⁰⁶ In addition, it is not clear from the survey whether the ERPs provided by respondents are in nominal or real terms.

- A30.65 Using the dividend growth model (DGM) it is possible to calculate an implied ERP using current market values, forecasts for earnings/dividends and an assumption about the RFR. We have previously placed less weight on such methods because they require the use of subjective input parameters such as analyst expectations and an assumption of future dividend growth rates.³⁰⁷ In the MCT Statement we considered ERP estimates produced by the Bank of England and said that we favoured these estimates over those produced by other organisations such as Bloomberg.³⁰⁸
- A30.66 Figure A30.4 below shows the Bank of England's estimates of the nominal ERP derived using a DGM.³⁰⁹ The chart shows that the Bank of England's estimate of the ERP declined during 2015 but remains above the long run average of 4.6%. However, the range of ERP estimates obtained from a DGM is wide, broadly ranging from around 2% to 8% over the entire period shown in the chart. However, in the post global financial crisis period (i.e. since 2011), the ERP estimates have tended to fall within a narrower range of 4% to 7%.

³⁰⁶ Paragraph 13.156, page 13-31, 2014 NIE Determination

³⁰⁷ See for example paragraphs A8.27 and A8.28 of Ofcom, A New Pricing Framework for Openreach, statement, 22 May 2009.

<http://stakeholders.ofcom.org.uk/binaries/consultations/openreachframework/statement/statement.pdf> and also paragraphs A10.56 to A10.60 of the March 2015 MCT Statement.

³⁰⁸ Footnote 171, 2015 MCT Statement. We understood that the Bank of England's results were derived from the FTSE All Share index while Bloomberg's results were based on the FTSE100 index. We favoured the Bank of England's results because the FTSE All Share reflects a more diversified portfolio of equities.

³⁰⁹ The ERP derived from the BoE DGM is nominal because it has been estimated by reference to nominal gilts.

Figure A30.4: Bank of England ERP estimates derived from a DGM

Source: Bank of England. Data to 19 June 2015. This is a modified version of Chart B.18 shown in the Bank of England's July 2015 Financial Stability Report. The original chart shows the ERP relative to the long run average ERP, which the Bank of England told us was 4.6% using its DGM approach. <http://www.bankofengland.co.uk/publications/Documents/fsr/2015/fsrfull1507.pdf>.

Recent regulatory precedents

A30.67 Table A30.4 above summarises the ERP used in decisions by UK regulators. ERP estimates from recent regulatory decisions, in real terms, are typically between 5% and 5.5%, although these ERP estimates should be viewed in conjunction with the real RFR and TMR used in these decisions.

Summary of empirical and regulatory estimates of the ERP

A30.68 Table A30.6 below summarises the preceding evidence on the ERP.

Table A30.6: Summary of evidence on the real ERP

Basis	Nominal/ real	ERP %
Historical premia of UK equities over gilts and treasury bills	Nominal	5% - 6%
Academic/user surveys	Unknown	c.5%
Dividend growth model	Nominal	4% - 7%
Recent regulatory precedent	Real	5% - 5.5%

Conclusion on TMR and ERP

A30.69 As explained above, when correctly interpreted, the real TMR consistent with the nominal TMR used in the March 2015 MCT Statement is 6.1%, not 6.3%. On the face of the available empirical evidence and uncertainty in forecasting such parameters, we consider that both are in the plausible range for the real cost of equity in the long-run.

- A30.70 Based on a real TMR of 6.1%, a real RFR of 1% implies a real ERP of 5.1%. This is equivalent to an ERP of 5.3% in nominal terms given our inflation assumption of 3.3%.
- A30.71 Table A30.6 above summarises the evidence on the ERP. Historical studies point to a nominal ERP of around 5% against gilts and 6% against treasury bills, although we place more weight on gilts in our analysis of the RFR.³¹⁰ Forward-looking studies also point to a nominal ERP of around 5%, whereas regulatory precedent would imply a slightly higher ERP (this is because the ERP for recent regulatory decisions in the table above is based on the real ERP which should be scaled by inflation to yield the nominal ERP).³¹¹
- A30.72 Overall, we consider that a real TMR of 6.1% more accurately reflects the underlying ERP, RFR and inflation assumptions used in our March 2015 MCT Statement (when we increased the ERP to offset a lower RFR but sought to maintain a stable TMR). The nominal TMR in this statement is 9.6%, the same as that used in the June 2015 LLCC Consultation and in the March 2015 MCT Statement, albeit slightly higher than implied in the most recent CMA decision.

Corporate tax rate

June 2015 LLCC Consultation

- A30.73 In the June 2015 LLCC Consultation we proposed to use a corporate tax rate of 20%. We noted that 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 2015/16.³¹² We proposed to use a corporate tax rate of 20% since this represented the best estimate at the time of what the tax rate will be on a forward-looking basis.

Stakeholder responses

- A30.74 TalkTalk noted that after we published our June 2015 LLCC Consultation, the Government announced in its July 2015 Summer Budget that the corporate tax rate would be reduced to 19% in 2017 and 18% by 2020. TalkTalk considered that this meant the tax rate in the final year of the charge control would be either 18% or 19%.³¹³
- A30.75 FTI, on behalf of BT, also noted the Summer Budget, and concluded that this implied an average tax rate of 19.3% over the three year control period.³¹⁴

³¹⁰ Although treasury bills are short term they are likely to face some inflation risk, unlike index-linked gilts.

³¹¹ The inflation assumptions underpinning regulatory decisions vary, but the CMA's assumption was up to 2.7% in the 2015 Bristol Water determination. This shifts the range for recent regulatory decisions to between 5.1% and 5.6%. For the inflation assumption used in this LLCC Statement, the range would be 5.2% to 5.7% for the nominal ERP.

³¹² Corporation tax rates available here: <http://www.hmrc.gov.uk/rates/corp.htm>

³¹³ TalkTalk response to the June 2015 LLCC Consultation, paragraphs 1.29 and 1.30.

³¹⁴ Paragraph 3.63, FTI report.

Our analysis and conclusion

A30.76 HMRC's website states that "at Summer Budget 2015, the government announced legislation setting the Corporation Tax main rate (for all profits except ring fenced profits) at 19% for the years starting the 1 April 2017, 2018 and 2019 and at 18% for the year starting 1 April 2020".³¹⁵ Our approach is to estimate the WACC for the last year of the control period (2018/19) and therefore we use the expected tax rate in this year, which is 19%, rather than an average over the control period.

Inflation

June 2015 LLCC Consultation

A30.77 In our June 2015 LLCC Consultation we proposed to estimate inflation using the RPI forecasts compiled by HM Treasury. We said that we considered it 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 real risk-free rate, are linked to RPI. Using data from the May 2015 HM Treasury publication, we proposed to use an RPI forecast of 3.2% for the 2018/19 financial year in our WACC calculation.³¹⁶

Stakeholder responses

A30.78 BT did not explicitly comment on our inflation assumption, although FTI's calculation of the BT Group WACC makes the same inflation assumption of 3.2%.³¹⁷

A30.79 Vodafone considered that there were a number of issues with basing our RPI inflation assumption on the average forecast from HM Treasury's survey of independent forecasts³¹⁸:

- these are not official forecasts and there is no assurance that the forecast, or the methodologies used to derive these forecasts are robust;
- the sample of independent forecasters who provide data varies between years and as between the CPI and the RPI series. This means that there is a lack of internal consistency between the average CPI and average RPI forecasts;
- the RPI forecasts in absolute terms show a large degree of variability (for example, in the May 2015 publication the 2019 RPI forecasts varied from 2.2% to 3.6%); and
- the implied forecasts of the 'wedge' between RPI and CPI varies significantly between forecasters and fails to take account of the latest estimates of the expected size of this wedge from the Office of Budget Responsibility (OBR). The

³¹⁵ <https://www.gov.uk/government/publications/rates-and-allowances-corporation-tax/rates-and-allowances-corporation-tax>.

³¹⁶ The May 2015 publication had an RPI forecast of 3.2% for 2018 and 3.0% for 2019, giving a weighted average of 3.2% for the financial year 2018/19. See Table M3, page 19, HM Treasury, *Forecasts for the UK economy: a comparison of independent forecasts*, May 2015.

³¹⁷ Table 12, FTI report.

³¹⁸ Vodafone response to the June 2015 LLCC Consultation, paragraph 6.31.

implied RPI-CPI wedge in the May 2015 publication for 2019 varies between 0.5% and 1.6%³¹⁹ while the OBR's estimate of the long term wedge is 1.0%.³²⁰

A30.80 Rather than use the RPI forecasts from HM Treasury, Vodafone proposed that we use an RPI forecast of 3% for 2018/19, based on the CPI forecast of 2% for 2018/19 used in the charge control model plus the OBR's estimate of the RPI-CPI wedge of 1.0%.

Our analysis

A30.81 From HM Treasury's February 2016 publication the average of independent forecasts for 2018 is 3.3% and for 2019 it is 3.2%, giving a weighted average for the financial year 2018/19 of 3.3%.³²¹ Using RPI forecasts from HM Treasury's February 2016 publication is consistent with the charge control model which uses the same source for CPI inflation. From the HM Treasury compilation of forecasts, CPIs is projected to be 2.0% by 2018/19, which is the value used in the charge control model for that year.

A30.82 Vodafone suggests that we should use an RPI assumption derived from the CPI assumption in the cost model for 2018/19 coupled with the OBR's forecast for the long-term RPI-CPI wedge (taken from the March 2015 OBR report), which is 1.0%³²²

A30.83 However, it is not clear why we should combine the CPI forecast for 2018/19 with the long-term wedge forecast by the OBR:

- first, other sources for the long-run wedge are available. For example, the Bank of England has a "central long-run estimate" for the RPI-CPI wedge of 1.3%.³²³ Based on a 2.0% inflation forecast for CPI in 2018/19, forecast RPI would be 3.3% for 2018/19 using this 1.3% wedge;
- second, we are concerned with forecasting inflation for a nominal WACC appropriate for the last year of the charge control (i.e. 2018/19). From the OBR's own forecasts of CPI and RPI, the implied wedge in 2018 is 1.3% and 1.2% in 2019, giving a weighted average of 1.3% for 2018/19³²⁴; and
- third, since we are concerned with the RPI forecast for 2018/19, if we were to place most weight on the OBR's forecast, then a more straightforward approach would be to use its forecast for RPI directly, rather than apply its implied RPI-CPI wedge to an alternative source for the CPI forecast (as Vodafone appears to have done). The OBR's RPI forecast for 2018/19 is 3.2%, which is only slightly lower than the average of HM Treasury forecasts for the same period.

³¹⁹ Derived from Table M3, page 20, HM Treasury, Forecasts for the UK economy: a comparison of independent forecasts, November 2015.

³²⁰ OBR, *Economic and Fiscal Outlook*, March 2015, Box 3.3, page 60.

³²¹ Table M3, page 20, HM Treasury, Forecasts for the UK economy: a comparison of independent forecasts, November 2015

³²² P.60-62 of Economic and fiscal outlook (March 2015),

http://cdn.budgetresponsibility.independent.gov.uk/March2015EFO_18-03-webv1.pdf

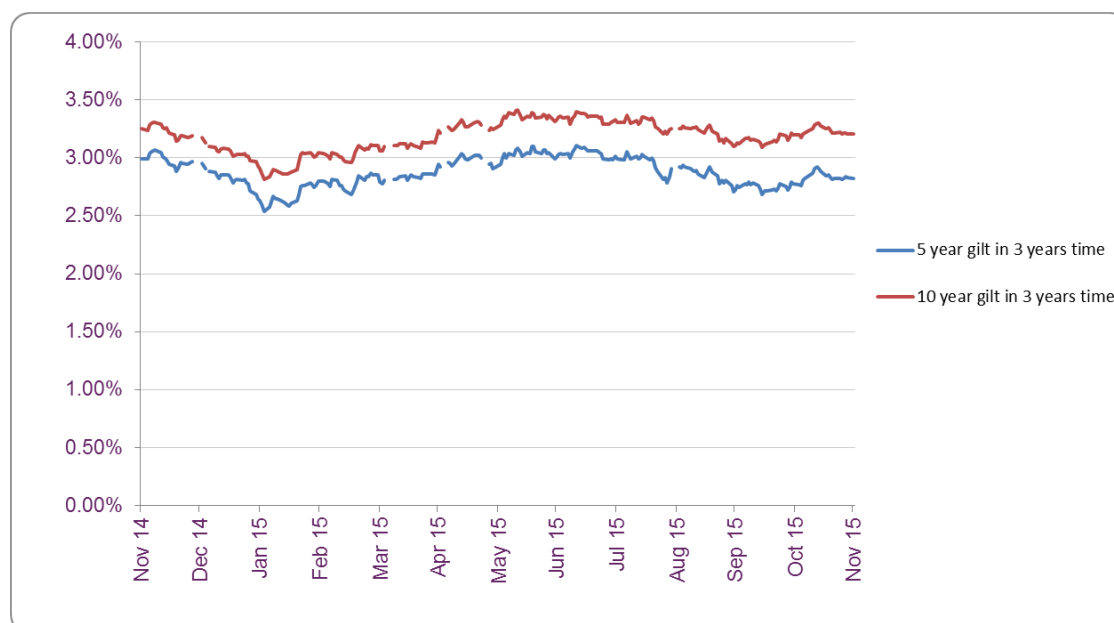
³²³ See p.34 of Bank of England Inflation report, February 2014,

<http://www.bankofengland.co.uk/publications/Documents/inflationreport/2014/ir14feb4.pdf>

³²⁴ See Table 3.6 of Economic and fiscal outlook (November 2016)

A30.84 We have additionally considered implied RPI on forward rates (the difference in yields between 5 and 10 year nominal and indexed-linked gilts taken out in three years' time). Implied inflation on five-year bonds taken out in three years' time has varied between 2.5% and 3.1% in the year to 30 November 2015 and for ten-year bonds taken out in three years' time the implied inflation is 2.8% to 3.4% when considering the same timeframe. The average implied inflation for a five-year bond taken out in three years' time is around 2.9% based on the year to 30 November 2015, and 3.2% for a ten-year bond. Figure A30.5 illustrates how these implied inflation rates have changed over the year to 30 November 2015.

Figure A30.5: Implied inflation on bonds taken out in three years' time



Source: Ofcom analysis based on Bank of England data.

A30.85 As in previous reviews, for the purposes of forecasting RPI inflation we prefer to start with the average of HM Treasury compiled forecasts and cross-check the reasonableness of this assumption with alternative sources and more long-run views on inflation.

A30.86 As summarised in Table A30.7 below, the average from the HM Treasury source is 3.3% for 2018/19, which compares to an OBR forecast of 3.2%; a long-run wedge analysis which gives either 3.0% or 3.3% depending on whether the OBR of the Bank of England view of the wedge is taken); or 2.9% to 3.2% based on break-even inflation inherent in forward gilt yields.

Table A30.7: RPI evidence

Forecast based on:	RPI estimate
HMT 2018/19 (forecasts as at February 2016)	3.3%
OBR forecast	3.2%
RPI-CPI wedge analysis	3.0% to 3.3%
Implied inflation on forward rates for 5 and 10	2.9% to 3.2%

year bonds

Source: Ofcom analysis

A30.87 In light of the above, we consider that the average forecast for RPI inflation (compiled by HM Treasury) of 3.3% for 2018/19 is reasonable. Combined with our real RFR estimate of 1.0%, the nominal RFR is therefore 4.3%.

Equity and asset beta – BT Group

June 2015 LLCC Consultation

A30.88 In June 2015 we proposed to derive a forward-looking equity beta for BT Group using the following three steps:

- **Derive the equity beta for BT Group using BT's equity returns relative to market equity returns over the recent past.** Based on a report commissioned from NERA, our preferred estimate was 0.97 based on the 2 year daily equity beta regressed against the FTSE All-Share index.
- **Derive the asset beta for BT Group by removing the effect of financial gearing from the equity beta estimated in the preceding step.** We used an asset beta for BT Group of 0.74, de-levered from the above equity beta using average gearing of 26% and a debt beta of 0.1.³²⁵
- **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.** We proposed to use a forward looking gearing rate of 30% but noted that the WACC calculation was not very sensitive to this assumption. Combining our asset beta estimate of 0.74, our forward looking gearing estimate of 30% and our debt beta estimate of 0.1 we derived a forward looking equity beta for BT Group of 1.01.

Stakeholder responses

Estimation of equity and asset betas

A30.89 Vodafone noted that we summarised four estimates of the current asset beta depending on the time period for the estimation and a benchmark stock market index (UK or World index). And that these varied between 0.58 and 0.74 (with an average of 0.66).³²⁶

A30.90 Vodafone was concerned that we selected the figure of 0.74, which was the highest of the four options presented and thought that even if we preferred one method, the other estimates have some information value.³²⁷

A30.91 Vodafone calculated that, over the past 7 years, BT Group's asset beta had averaged around 0.6 and that the evidence from the one year beta values

³²⁵ Asset betas are calculated using the following formula:

$$\beta_{asset} = \text{Gearing} * \beta_{debt} + (1 - \text{Gearing}) * \beta_{equity}$$

³²⁶ Vodafone response to the June 2015 LLCC Consultation, paragraph 6.2.

³²⁷ Vodafone response to the June 2015 LLCC Consultation, paragraph 6.2.

supported the view that the beta value has 'peaked' and therefore 0.74 represented a high point in random variation around the underlying value.³²⁸

- A30.92 Vodafone considered that there were reasons why the asset beta may genuinely increase over time such as structural changes in the business or changes in investor sentiment. However, Vodafone thought that it was also the case that beta varies over time simply as a result of statistical fluctuation. In particular, the increase in the BT Group beta since the previous leased line charge control determination appeared to Vodafone to be greater than would be expected given the rate of structural change in BT's business.
- A30.93 Vodafone considered that there was a strong case for taking a longer term view on the group asset beta of around 0.6.
- A30.94 FTI, commissioned by BT, said that "in selecting two year daily betas, Ofcom has taken an approach which is consistent with its previous price controls. However, there is a range of regulatory precedent in this area with various frequencies and time periods being considered".³²⁹ FTI added that "since the beta is forward looking, it therefore becomes a judgement as to where BT's equity beta is likely to lie over the period. It could be argued that a longer time period might be more appropriate as the beta would be less influenced by any short term rise or falls. However, it could also be argued that more recent estimates are likely to be a better predictor of the future because they capture the most recent perceptions of the non-diversifiable risk of the company".³³⁰
- A30.95 FTI also noted that there is no definitive guidance on the most appropriate time period or sampling frequency to use when estimating the equity beta. For example, while the 2003 Smithers and Co report recommended using one or two year daily equity betas, a more recent paper by Gilbert et al³³¹ says that monthly and quarterly sampling frequencies are generally more reliable than those estimated using higher sampling frequencies.³³² FTI considered that, using data to 30 June 2015, BT Group's equity beta would lie in the range 0.85 to 1.0, which corresponded to an asset beta range of 0.66 to 0.77. FTI assumed an asset beta of 0.73 for BT Group in its calculations.³³³

Forward-looking gearing

- A30.96 TalkTalk agreed that a forward looking gearing of 30% was appropriate. In particular, it agreed that we should use a level of gearing higher than BT's current level of gearing.³³⁴
- A30.97 Vodafone also considered that 30% was a reasonable gearing assumption.³³⁵
- A30.98 FTI considered that Ofcom's approach to relative risk, whereby BT's gearing would lie somewhere between UK telecoms comparators and utilities seemed reasonable,

³²⁸ Vodafone response to the June 2015 LLCC Consultation, paragraphs 6.4 and 6.5.

³²⁹ Paragraph 3.24, FTI report.

³³⁰ Paragraph 3.27, FTI report.

³³¹ T.Gilbert. C. Hrdlicka, J. Kalodimos, S. Siegel, 20 December 2013, *Daily Data is Bad for Beta: Opacity and Frequency-Dependent Betas*.

³³² Paragraphs 3.22 and 3.23, FTI report.

³³³ See Table 12 on page 28, FTI report.

³³⁴ TalkTalk response to the June 2015 LLCC Consultation, paragraph 1.37.

³³⁵ Vodafone response to the June 2015 LLCC Consultation, paragraph 6.34.

although FTI considered that Ofcom's practical application was less well justified. FTI noted that if gearing for BT was at 30%, this would lie below that for Sky (at 32%), yet in looking at the listed utilities, a gearing of nearer 50% for these companies would be obtained if Centrica and SSE (which do not have significant regulated operations) were removed.³³⁶

A30.99 FTI considered that Ofcom had not sufficiently reasoned how these comparisons should be interpreted alongside the evidence that BT's actual gearing had declined. FTI did concur, however, that the gearing assumption did not have a large impact on the pre-tax WACC and that Ofcom's approach could be justified in that context.

Our analysis

Equity beta derived from market data

A30.100 We commissioned NERA to update its report which can be found at Annex 31. NERA estimated equity betas for BT Group against the FTSE All Share and FTSE All World indices, using one-year and two-year daily data up to 31 October 2015. Table A30.8 summarises NERA's updated estimates for the BT Group equity beta alongside the corresponding estimates from its May 2015 report (which used data up to 31 January 2015).

Table A30.8: BT Group equity beta estimate

	FTSE All Share		FTSE All World		Average gearing	
Data cut-off	Oct '15	Jan '15	Oct '15	Jan '15	Oct '15	Jan '15
2-year daily	0.90 (0.05)	0.97 (0.07)	0.81 (0.07)	0.82 (0.09)	22%	26%
1-year daily	0.93 (0.06)	0.85 (0.08)	0.88 (0.09)	0.73 (0.12)	20%	23%

Note: Standard errors shown in parentheses

Source: Tables 3.1 and 3.2, NERA's Final Report; Tables 3.1 and 3.2, NERA's May 2015 Report.

A30.101 In response to Vodafone and FTI, we recognise that there is no established best practice on the most appropriate time period or sampling frequency to use when estimating the equity beta and asset beta.

A30.102 It is therefore necessary to use our regulatory judgement when estimating BT's equity beta and we place weight on adopting a consistent approach over time. In our June 2015 LLCC Consultation and previous charge control decisions we have generally placed most weight on the equity beta calculated over a two 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. We have also tended to use daily data as opposed to weekly or monthly data.³³⁷

³³⁶ Paragraph 3.42, FTI report.

³³⁷ In our August 2005 WACC Statement we considered the advantages and disadvantages of using daily data. Advantages included i) lower standard errors than lower frequency data, ii) the option of using shorter data windows where parameters appear unstable and iii) beta estimates based on lower frequencies can be sensitive to the day on which the data point is taken. Disadvantages included

A30.103 We note from Figure 3.1 of the NERA report, that the current two year estimate for the BT Group equity beta at 0.90 (against the FTSE All Share) is lower than the BT Group equity beta estimated at the time of the last leased lines charge control statement (i.e. in early 2013) and at the time of the last fixed access market review (i.e. in early/mid-2014). Specifically, at the time of the last leased lines charge control the BT Group two-year equity beta was 1.01 against the FTSE All Share³³⁸ and in the June 2014 FAMR statement it was estimated at 1.01 against the FTSE All Share.³³⁹

A30.104 Moreover, while in the May 2015 NERA report, the two year equity and asset betas were above the one year estimates, this situation has now reversed with two year average betas being less than the corresponding one year average (see Tables 3.1 and 3.2 of the NERA report).

A30.105 Therefore, we disagree with Vodafone that the current two year estimate of the equity beta and asset beta necessarily represents “a high point” around what we acknowledge is an inherently uncertain parameter.

A30.106 When estimating the equity beta for BT Group 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.³⁴⁰ Furthermore, the FTSE All-Share is a well-diversified index with high levels of liquidity.

A30.107 Our preferred estimate of the BT Group equity beta is therefore 0.90 (June 2015 LLCC Consultation: 0.97), based on the two year daily equity beta against the FTSE All-Share index.

Calculating an asset beta from the equity beta

A30.108 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 two year equity beta was de-levered to an asset beta using the average two year gearing in the same period. NERA calculated the asset betas assuming a debt beta of zero and 0.10.

A30.109 Table A30.9 summarises NERA’s estimates of the asset beta for BT Group.

statistical problems (though these can be mitigated by statistical corrections such as Dimson adjustments). See paragraphs 6.8 and 6.9 of that statement.

³³⁸ At that time, we commissioned Brattle to estimate the BT and comparator company betas. For the BT equity beta in 2013, see Table 1 of the January 2013 Brattle report at <http://stakeholders.ofcom.org.uk/binaries/consultations/business-connectivity/statement/equity-beta.pdf>

³³⁹ See Table 1 of the March 2014 Brattle report at http://stakeholders.ofcom.org.uk/binaries/telecoms/ga/fixed-access-market-reviews-2014/draftstatement/15_annex15.pdf

³⁴⁰ Page 7 of NERA’s final report says “despite wider global integration, however, the academic literature finds a general consensus that equity markets are less integrated than bond or money markets, and there is still a significant ‘equity home bias’, i.e. the observation that equity investors have a preference for domestic assets, despite the wider benefits of diversification”. Also, 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 A30.9: BT Group asset beta estimate

	Debt beta	FTSE All Share		FTSE All World		Average gearing	
Data cut-off		Oct '15	Jan '15	Oct '15	Jan '15	Oct '15	Jan '15
2-year	0	0.70	0.71	0.63	0.61	22%	26%
	0.1	0.72	0.74	0.65	0.64		
1-year	0	0.74	0.65	0.70	0.56	20%	23%
	0.1	0.76	0.67	0.72	0.58		

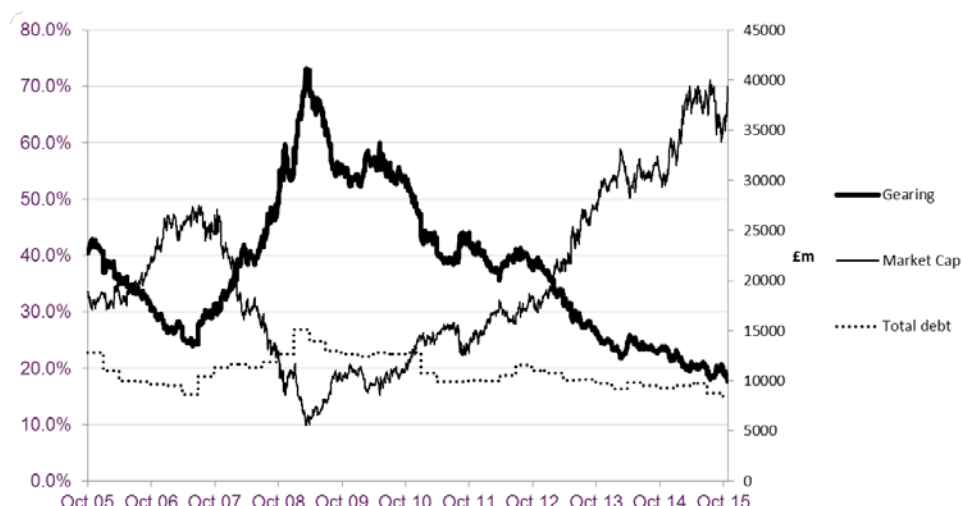
Source: Table 3.2, NERA's Final Report and Table 3.2, NERA's First Report. Average gearing is calculated over the corresponding 1-year or 2-year period used to estimate the equity beta.

A30.110 Consistent with our past practice of favouring the two year equity beta estimation based on the FTSE All Share index, we have used an asset beta of 0.72 for BT Group. This is consistent with an equity beta for BT Group of 0.90, de-levered using average gearing of 22% and a debt beta of 0.1.

Forward-looking gearing

A30.111 As illustrated in Figure A30.6 below, BT's gearing has fallen significantly in recent years and its current gearing level of 18%³⁴¹ 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 increased by a factor of nearly seven since its nadir in late 2008; but also by declining debt levels which have nearly halved during the same period. Over the last ten years (since October 2005) BT's gearing has averaged approximately 40%, while over the last five years it has been closer to 30%.

³⁴¹ Based on its debt position as at 30 October 2015 and a market capitalisation at that point of £39bn. Note that NERA calculates debt in the gearing calculation as the sum of short term and long term debt. See page 10 of NERA's Final Report. Note that 18% is BT's current gearing level, while the average gearing level over the corresponding period is used in the estimation of the asset beta. As shown in Table A29.7, BT's average gearing over the last 2 years is 22% and over the last year is 20%.

Figure A30.6 BT Group's gearing, market cap and total debt

Source: Bloomberg ($\text{debt} = \text{short term} + \text{long term debt}$; $\text{gearing} = \text{debt} / (\text{Market cap} + \text{debt})$).

A30.112 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.³⁴² 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 because this is particularly low by reference to gearing levels over a longer period (see above) and by reference to comparator companies (see below).

A30.113 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 operators³⁴³ while the upper end of the range is comparable to EU telecoms operators but slightly below that of UK utilities.³⁴⁴ We note that it has been at least three years since BT's gearing has been at the top end of this range.³⁴⁵

³⁴² 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)

³⁴³ Table 3.2 of NERA's Final report shows that gearing levels of UK telecoms operators over the last one and two years have ranged from 15% to 36%, averaging around 25%.

³⁴⁴ Table 3.2 of NERA's Final Report shows that gearing levels of UK Utilities averaged around 45% over the last one and two years. In response to FTI's suggestion, we note that Centrica has been removed from the utilities sample in NERA's report, which increases the average utility gearing ratio to closer to 50%. Table 3.4 of NERA's final report shows that gearing levels for European telecoms operators averaged around 35% in the last one and two years, though the gearing of individual operators ranged from around 10% (Iliad) to 70% (Telecom Italia).

³⁴⁵ It was above 40% during the Global Financial Crisis when its enterprise value, along with many other companies, was depressed.

A30.114 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. This is also similar to the gearing of 32% assumed in the June 2014 FAMR Statement and similar to BT's average gearing over the last five years.

A30.115 In any case, the WACC calculation is not very sensitive to the assumed forward-looking gearing. For BT Group, the WACC is 9.9% pre-tax nominal for all gearing assumptions between 24% and 44%, assuming all other WACC parameters remain unchanged.

Estimate of forward-looking equity beta

A30.116 Combining our asset beta estimate of 0.72, 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 0.99. This is calculated using the following formula:

$$\beta_{equity} = \frac{\beta_{asset} - \beta_{debt} * Gearing}{1 - Gearing}$$

Debt beta

June 2015 LLCC Consultation

A30.117 In our June 2015 Statement we assumed a debt beta of 0.1.

Stakeholder responses

A30.118 FTI considered that the evidence in support of a debt beta of 0.1 was mixed. FTI said that there is a relationship between debt beta and gearing and that, while other regulators had adopted a non-zero debt beta in some decisions, the level of gearing assumed by other regulators was somewhat higher than we had assumed for BT even though the debt beta used by Ofcom was similar.

A30.119 FTI considered that our proposed debt beta of 0.1 did not appear to be robustly justified, notwithstanding that we had adopted a similar position in the past. It thought that a debt beta of less than 0.1 could be justified for BT, warranting a small increase in the cost of equity.

Our analysis

A30.120 We recognise that there is likely to be a relationship between gearing and the systematic risk of debt (represented by the debt beta) and with the overall risk of debt. For example when seeking to assess default risk, credit rating agencies consider gearing amongst other factors.

A30.121 The relationship between the level of gearing and risk depends on the nature of the underlying business. For example, a water company with a higher level of gearing than BT might still be able to achieve the same credit rating as BT. While we recognise that credit rating is not a direct proxy for the debt beta, the relationship between the debt beta and gearing for BT may be different to the debt beta and gearing relationship for utilities. In particular, a debt beta of say 0.1 might be associated with a lower level of gearing for BT than for regulated utilities such as water companies.

A30.122 There are significant practical difficulties in estimating debt betas robustly.³⁴⁶ 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*”.³⁴⁷

A30.123 We have therefore considered other sources of evidence such as academic texts and previous CMA 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 0.2³⁴⁸, and
- the CMA used a debt beta of:
 - 0.05 in the NIE Determination³⁴⁹;
 - 0.1 in its 2007 Heathrow and Gatwick review and its 2010 Bristol Water review³⁵⁰; and
 - zero in its 2015 Bristol Water review.³⁵¹

A30.124 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 A30.10 shows the gearing levels and debt premia we have used alongside our debt beta assumptions in recent decisions.

Table A30.10: 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: Ofcom³⁵²

³⁴⁶ 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 equity market returns is weak.

³⁴⁷ 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>

³⁴⁸ Page 436, Brealey, Myers and Allen, 2013, *Principles of Corporate Finance*, 11th Edition.

³⁴⁹ Paragraph 13.175c, page 13-36, NIE Determination.

³⁵⁰ CC report on Heathrow and Gatwick, Appendix F, paragraph 106.

<http://webarchive.nationalarchives.gov.uk/20140402141250/http://www.competition-commission.org.uk/our-work/directory-of-all-inquiries/heathrow-and-gatwick-quinquennial-review/final-report-and-appendices-glossary> and CMA 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>

³⁵¹ CMA noted that its choice of “debt beta has very little impact on the cost of capital if Bristol Water’s gearing level is similar to the comparators used”. Paragraph 10.150, Bristol Water 2015

³⁵² 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).

A30.125 We explain below how we have estimated our proposed debt premium range for BT Group of 1.1% to 1.5% (June 2015 LLCC Consultation: 1% to 1.4%). 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%, which is also similar to 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 consultation are sufficiently different to the levels assumed in the June 2014 FAMR Statement to justify the use of a different debt beta.

Conclusion

A30.126 We consider it appropriate to assume the same debt beta of 0.1 as we used in the June 2015 LLCC Consultation and the June 2014 FAMR Statement because our estimates of BT's debt premium and gearing have not changed significantly from those publications.

Cost of debt

June 2015 LLCC Consultation

A30.127 In our June 2015 LLCC Consultation we estimated the cost of debt by separately estimating two components:

- the nominal RFR (which we estimated at 4.2%); and
- the debt premium³⁵³ of 1.0 to 1.4% based on spreads of BT sterling-denominated bonds and BBB benchmark indices. For the purpose of calculating a BT Group WACC we used 1.2%, the mid-point of this range.

A30.128 Combining these components produced a nominal, pre-tax cost of debt for BT Group of 5.4%.

Stakeholder responses

A30.129 BT considered that our proposed approach (which estimated debt premia from current yields-to-maturity) focused only on a forward looking cost of debt and took no account of the cost of BT's embedded debt i.e. the debt which BT has already raised.³⁵⁴

A30.130 FTI calculated that the average coupon (which is the amount BT actually has to pay) on its outstanding sterling-denominated bonds is over 7.0% which is higher than the 5.4% proposed, reflecting a reduction in interest rates since BT issued much of its debt.³⁵⁵ FTI considered that the difference between the costs of existing and new debt is one reason why many sectoral regulators consider both elements of the cost of debt when making their determinations.³⁵⁶ FTI stated that Ofcom's

³⁵³ 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.

³⁵⁴ Annex I, BT response to the June 2015 LLCC Consultation, paragraph 71.

³⁵⁵ Paragraph 3.52, FTI report.

³⁵⁶ Paragraph 3.53, FTI report.

decision to focus purely on forward-looking debt costs is at odds with other regulators in the UK such as the CMA (for NIE), Ofwat, CAA and Ofgem.³⁵⁷

A30.131 FTI considered that our exclusion of the embedded cost of debt was a key reason why our estimate of BT's cost of debt appeared to them to be low in comparison to other sectoral regulators' decisions. FTI calculated our implied real, pre-tax cost of debt of 2.2%, and this compared to a range of 2.6% to 3.2% taken from other regulated sectors.³⁵⁸ FTI also thought that in many cases, these regulators were considering setting the cost of debt for businesses assumed to have stronger credit ratings (implying a lower cost of debt).³⁵⁹

A30.132 FTI did not suggest that BT's embedded debt costs should be treated as a straight pass-through to consumers, but that in line with other regulators' approaches, an estimate of the efficient cost of embedded debt could be taken into account.³⁶⁰

A30.133 FTI did not have information about the amount of debt BT expects to refinance or raise during the charge control period, but suggested that if we had adopted a 50 / 50 weighting of BT's embedded debt (7.0%) and new debt (5.4%) this would have implied an overall cost of debt of 6.2% (nominal, pre-tax). This was 80 basis points (i.e. 0.8%) higher than our proposed rate.³⁶¹

A30.134 FTI said that, unlike many sectoral regulators, we made no explicit allowance in our assessment for issuance costs.³⁶² FTI considered that on the basis of other sectoral regulators' precedents it might be reasonable to add another 10 to 20 basis points on to the cost of debt observed from either coupons or the yield-to-maturity when setting BT's all-in cost of debt allowance.

A30.135 FTI said that a more appropriate cost of debt for BT would be 6.3%, incorporating an additional 0.8% to reflect embedded debt and 0.1% for transaction costs.³⁶³

A30.136 TalkTalk noted that the spreads of different maturities of BT debt instruments over gilts was between 0.8% and 1.3%.³⁶⁴ When TalkTalk combined this with its own estimate of the real RFR (based on a spot yield on index linked gilts of around - 0.9%), and an RPI inflation rate for July 2015 of 1.0%, TalkTalk calculated the nominal rate of interest on BT's debt was 1.0% to 1.5%.³⁶⁵ Taking what TalkTalk described as a "top-down" approach based on the yield to maturity for BT debt of

³⁵⁷ Ibid.

³⁵⁸ Table 10 of FTI's report cites the following pre-tax real costs of debt used in regulatory decisions: Ofgem, 17 December 2012, 2.92%; ORR, October 2013, 3.00%; CAA, January 2014, 3.20%; Competition Commission, March 2014, 3.10%; Ofgem, November 2014, 2.60%; Ofwat, December 2014, 2.59%.

³⁵⁹ Paragraph 3.55, FTI report.

³⁶⁰ Paragraph 3.56, FTI report.

³⁶¹ Paragraph 3.57, FTI report.

³⁶² Paragraph 3.58, FTI report. For example, FTI noted the CMA included 20 basis points in its cost of debt estimate in the Northern Ireland Electricity price control appeal in 2014 for issuance costs and fees (including for interest rate hedges); Ofwat included a 10 basis point uplift to the cost of debt at PR14 to reflect transaction costs; and the CAA included 15 and 20 basis points uplifts to the costs of debt for Heathrow and Gatwick Airports respectively in its Q6 price control determination in January 2014.

³⁶³ Paragraph 3.60, FTI report.

³⁶⁴ TalkTalk response to the June 2015 LLCC Consultation, paragraph 1.39.

³⁶⁵ TalkTalk response to the June 2015 LLCC Consultation, paragraph 1.40.

different maturities, TalkTalk calculated a value weighted average cost of debt of 2.61%.³⁶⁶

A30.137 TalkTalk considered that we had offered no justification for why our estimated cost of debt on a forward-looking basis should diverge so far from the observable market data, other than to maintain consistency between our approach to the cost of debt and the cost of equity. TalkTalk considered that consistency cannot be a reason to knowingly ignore market data which allowed a key cost parameter to be directly observed.³⁶⁷

A30.138 Vodafone also noted that we used a methodology where the cost of debt is based on the same long-term RFR as the cost of equity. Vodafone thought that the implication of this was that the allowed cost of debt was currently very high relative to the market cost of new debt and also probably high relative to BT's actual cost of debt (even taking account of fixed rate issues).

A30.139 Vodafone had the following concerns with Ofcom's methodology³⁶⁸:

- first, there is a contrast between this and the approach adopted by other regulators – who either: (a) estimate a cost of embedded and new debt (CMA, Ofwat) or (b) use a rolling index of a corporate debt yield (Ofgem). In Vodafone's view, Ofcom's approach is more generous than either of these methods; and
- second, the justification for taking a long-term view on the cost of debt was not clear.

Our analysis

Embedded debt and current debt approaches

A30.140 An embedded debt approach recognises that a firm will issue debt over a number of years and therefore at various points through the economic cycle. It uses the cost of the firm's actual debt, which may be cross-checked against benchmark indices at the time of issuance. Regulators that look at embedded debt typically then combine the estimate for embedded debt with a view on current (or forecast) debt rates to produce an estimate of the overall cost of debt.

A30.141 Our proposed approach, which uses the long-run RFR plus a debt premium also recognises that BT makes long-lived investment and financing decisions through the economic cycle.

A30.142 In contrast to FTI's suggestion and our proposed approach, TalkTalk advocated a current cost of debt approach. This means the cost of debt used in the charge control only reflects the expected current cost of debt. In effect, this is an estimate of the cost of debt as if BT issued all its debt today (or during the control period).

Embedded debt approach

A30.143 FTI estimates the cost of embedded debt with reference to the coupon on the sterling denominated fixed rate bonds. Implicit in this calculation is that the debt

³⁶⁶ TalkTalk response to the June 2015 LLCC Consultation, paragraph 1.41.

³⁶⁷ TalkTalk response to the June 2015 LLCC Consultation, paragraph 1.42.

³⁶⁸ Vodafone response to the June 2015 LLCC Consultation, paragraph 6.35.

was issued at par (i.e. at a price equal to the face value of the bond). If the debt was issued above (or below) par then the actual cost of this debt will be below (or above) the coupon.³⁶⁹ We examined the bonds issued by BT and the yields-to-maturity on issuance, and we note that on the whole bonds were issued at around par. Our estimate of the cost of embedded debt on fixed rate sterling bonds is 6.9%. We note that this is similar to FTI's estimate (which was 7.0%).

A30.144 FTI combined its estimate of embedded debt costs with the cost of new debt in the ratio 50/50. However, FTI incorrectly used our estimate of the long-run cost of debt (June 2015 LLCC Consultation: 5.4%) as its estimate of the current cost of debt. Our estimate of BT's current cost of debt is 2.6 - 2.9% (based on the average yield of its bonds as at 30 October 2015).³⁷⁰ In our view, the current cost of debt (based on current yields to maturity) is appropriate as an estimate of non-embedded debt to be used in combination with an estimate of embedded debt (and we note this is the approach adopted by a number of other UK economic regulators). Alternatively, the use of the long-run cost of debt (based on a long-run view of the RFR coupled with the (current) debt premium, will also reflect elements of embedded as well as non-embedded debt. This is because using a long-run average RFR will tend to smooth out differences between yields on embedded and new debt.

A30.145 FTI uses a weighting of embedded to new debt of 50/50. The proportion of new debt issued between now and the last year of the control period can be estimated by considering the average maturity of BT's debt and therefore the hypothetical average annual re-financing requirement. On this basis, given that BT's sterling debt has an average maturity of just over eight years and that this is a three year charge control, approximately 35% of debt in the third year of the control period will be 'new'.

A30.146 An alternative approach to estimating the amount of new debt is to consider when existing debt needs to be replaced and/or new debt is required to finance new investments. We note that, approximately 36% of BT's existing debt will mature before the start of the last year of the control period (1 April 2018) with a further 18% due to mature during the last year of the control period. We do not know whether, and if so, when, BT plans to refinance this debt but it suggests that the proportion of new debt could be of the order of 50%.

A30.147 Our estimate of the overall cost of debt under an embedded debt approach suggests a range of 4.8% to 5.6%, which is lower than FTI's estimate.

Table A30.11: Ofcom's estimate of the cost of debt under an embedded debt approach

	Cost of debt (pre-tax nominal)	Weighting
Embedded debt	6.9% to 7.0%	50% to 65%
New debt	2.6% - 2.9%	35% to 50%
Overall cost of debt	4.8% to 5.6%	

Source: Ofcom, using data from Bloomberg

³⁶⁹ The actual cost of debt is the yield-to-maturity on issuance. This takes into account the actual proceeds received (before costs) and actual coupon payments.

³⁷⁰ The range depends on the averaging period. The range of 2.6-2.9% captures the average yield on sterling denominated debt for averaging periods from one day to two years.

A30.148 For reasons of regulatory consistency, our preference is to retain the RFR plus debt premium approach. In this context, regulatory consistency means a consistent approach both to how we set charge controls through time and in how we calculate common components underpinning different parts of the cost stack in the same charge control (in this case the RFR underpinning the cost of debt and the cost of equity).

A30.149 Were we to move to an embedded debt approach, we note from the preceding table that while there is some uncertainty over the precise value, the plausible range for the overall cost of debt (of 4.8% to 5.6%) encompasses the value for the pre-tax nominal cost of debt obtained from our preferred RFR plus debt premium approach (5.5%).

Current cost approach

A30.150 TalkTalk's suggested approach is to use the current cost of debt, whether this is calculated by using current yields-to-maturity or a current RFR plus current debt premium approach.

A30.151 We have concerns with a pure current cost of debt approach for the following reasons:

- first, the current cost of debt can differ significantly from BT's actual cost of debt (and indeed, the cost of debt of any efficiently financed firm), since an efficiently financed firm would be expected to issue debt throughout the economic cycle. Both our RFR plus debt premium approach and an embedded cost of debt approach will smooth the projected cost of debt over time;
- second, quantitative easing (QE) will have affected yields on index-linked gilts. The scale (or timing of QE) coupled with the extended period of low interest rates, may have been beyond what was reasonably expected ex-ante – even for an efficiently financed firm. In other words, even considering the “normal” cycle of interest rates, an efficiently financed firm, might not have expected rates to be quite as low (or for as long) as they have turned out to be.

A30.152 Therefore, we do not favour a pure current cost of debt approach in setting charge controls for regulated services such as leased lines.

Issuance costs

A30.153 To date, we have not explicitly included debt issuance costs in our charge controls. FTI argued that it might be reasonable to allow 10 to 20 basis points on the cost of debt observed from either coupons or yields-to-maturity.

A30.154 In principle, we recognise that issuance costs are likely to form part of the efficient future costs of debt finance. However, whether an allowance should be made for these depends on the context. If the operating costs of the firm reflect top-down accounting information where the costs of the firm's treasury and financing functions are already captured, then a further allowance would not be appropriate.

A30.155 Moreover, whether a blanket uplift of 10 to 20 basis points was appropriate, would depend on the firm in question. We have not received information from BT on its actual issuance costs to support this point from FTI, but we note that the CMA in the

recent Bristol Water report allowed for only 10 basis points in the cost of debt for a notional company.³⁷¹

A30.156 In the present case, we note that our RFR plus debt premium approach yields a rate above the mid-point of the range when considering embedded debt.

A30.157 For these two reasons, we have not allowed a further uplift to the cost of debt for issuance costs.³⁷²

Estimating the rate under our preferred approach

A30.158 We have estimated a debt premium for BT by considering the observed yields on sterling denominated debt for BT Group relative to benchmark nominal gilt yields with the same maturity as BT's debt. As a cross-check we have also taken account of spreads on an index of BBB bonds over government gilts because BT's debt is BBB rated.

A30.159 For the purposes of determining a range for the debt premium in the consultation we considered debt spreads over a 12 month period. In this statement we update that data and supplement it with averages over a 24 month period.

A30.160 Approximately 30% of BT's outstanding listed debt is sterling denominated, with 50% dollar denominated and the remainder euro denominated. In this statement 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 because of the opportunity for arbitrage.³⁷³

A30.161 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. Table A30.12 lists the sterling debt we have considered alongside the average, minimum, maximum and upper and lower quartile spread of this debt in the last 12 months and 24 months over nominal UK government gilts.

Table A30.12: Spread of sterling denominated debt over UK gilts for BT (as at 30 October 2015)

Maturity date	Years to maturity	1 year avg	1 year min	1 year max	1 year lower quartile	1 year upper quartile	2 year avg	2 year min	2 year max	2 year lower quartile	2 year upper quartile	Current (Oct 2015)
Dec 16	1.1	1.0%	0.8%	1.1%	0.9%	1.0%	1.0%	0.8%	1.2%	0.9%	1.0%	1.1%
Jun 17	1.6	1.0%	0.9%	1.3%	0.9%	1.1%	1.0%	0.9%	1.3%	0.9%	1.1%	1.2%
Mar 20	4.4	1.1%	0.9%	1.3%	1.0%	1.2%	1.1%	0.9%	1.3%	1.0%	1.2%	1.3%

³⁷¹ See Appendix 10, para 48, CMA Bristol Water (October 2015), https://assets.digital.cabinet-office.gov.uk/media/5627997640f0b60368000001/Appendices_5.1_-_11.1_and_glossary.pdf

³⁷² We also note that increasing the cost of debt by 10 basis points (0.1%) does not change the BT Group pre-tax nominal WACC from 9.9%.

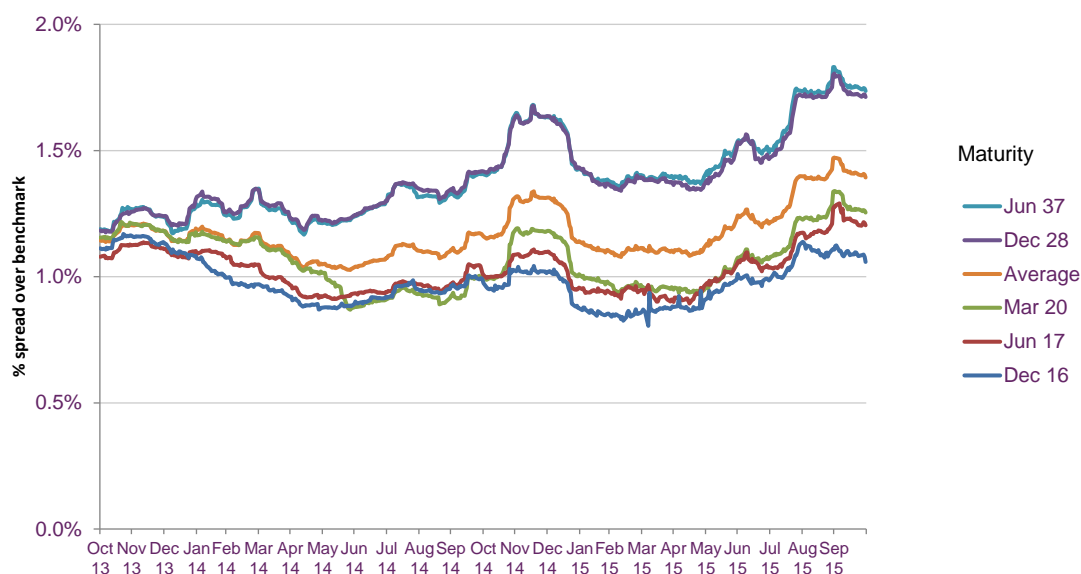
³⁷³ We note that BT's website says "Our policy is to raise debt in markets/currencies where there is strong investor demand and we get the best rate, if that is outside of the UK then we will swap the debt immediately into fixed sterling to mitigate currency risk". See: <http://www.btplc.com/Sharesandperformance/Fixedincome/index.htm>

Dec 28	13.1	1.5%	1.3%	1.8%	1.4%	1.6%	1.4%	1.2%	1.8%	1.3%	1.5%	1.7%
Jun 37	21.7	1.5%	1.4%	1.8%	1.4%	1.6%	1.4%	1.2%	1.8%	1.3%	1.5%	1.8%
Average	8.4	1.2%	1.1%	1.5%	1.1%	1.3%	1.2%	1.0%	1.5%	1.1%	1.2%	1.4%

Source: Bloomberg, Ofcom analysis. Spread over nominal gilt yields. Average maturity is a simple average. All of these bonds have a Bloomberg Composite credit rating of BBB. Data to 30 October 2015.

A30.162 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 for sterling debt is just over 8years.³⁷⁴ Figure A30.7 charts the spread of BT's sterling debt over the last two years.

Figure A30.7: Spread of sterling denominated debt over UK gilts for BT



Source: Bloomberg, Ofcom analysis. Data to 31 October 2015.

A30.163 The preceding table shows that the debt premium for BT Group has been between 1.1% and 1.5% over the last year, averaging 1.2%. The two year range is 1.0% to 1.5% with an average of 1.2%.

A30.164 As a cross-check, we have also considered the spread of an index of BBB bonds over nominal gilts with a ten year maturity. We have used BBB bonds since each of BT's sterling listed bonds has a Bloomberg composite rating of BBB³⁷⁵ and we have considered bonds with ten year maturities since this is close to the average maturity of BT's listed sterling debt (which is just over eight years).

A30.165 Figure A30.8 shows the spread of an index of BBB bonds over UK gilts. Over the last year this spread has ranged from 1.1% to 1.9%, with an average of 1.4%. Over

³⁷⁴ For BT's sterling debt, the weighted average tenor (weighted by amount outstanding) is currently similar to the simple average (approximately 8.4 years in both cases). For BT's overall debt (sterling and non-sterling) the weighted average tenor is around 7.8 years.

³⁷⁵ 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.

the last two years this spread has ranged from 1.1% to 1.9%, with an average of 1.3%. We note that:

- similar to our consultation, the BBB index spreads are slightly higher than BT's actual debt spreads over gilts; and
- the BBB index premia have increased more than BT's actual debt thereby widening that gap between spreads estimated using the BBB index compared to the average of spreads for BT bonds.

Figure A30.8: Spread over nominal gilts of an index of 10-year BBB bonds



Table A30.13: Summary of spreads on BT Group sterling denominated debt and 10-year BBB bonds:

	Years to maturity	1 year ave	1 year min	1 year max	1 year lower quartile	1 year upper quartile	2 year ave	2 year min	2 year max	2 year lower quartile	2 year upper quartile	Current (Oct 2015)
BT Average	8.4	1.2%	1.1%	1.5%	1.1%	1.3%	1.2%	1.0%	1.5%	1.1%	1.2%	1.4%
BBB index	10	1.4%	1.1%	1.9%	1.2%	1.5%	1.3%	1.1%	1.9%	1.2%	1.4%	1.8%

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.

Conclusion

A30.166 In our June consultation, we considered that the appropriate range for the debt premium was 1.0% to 1.4% which captured the minimum and maximum spread (averaged across all maturities) for BT's bonds and ten year BBB bonds over the preceding year.

A30.167 We propose placing less weight on the BBB composite index, and prefer to rely on it as a cross-check, noting that the composite index used is also based on bonds with ten years to maturity, greater than BT's average maturity of debt at present. We have also looked at debt premia over more than the last year.

A30.168 Taken in the round, we consider that an appropriate range for the BT Group debt premium is 1.1% to 1.5%, recognising the upwards movement in debt premia since the consultation. The mid-point of this range is 1.3%, however, we do not consider that this mid-point represents an appropriate central estimate for the BT Group debt premium. First, the average yield above gilts on BT's actual debt is 1.2% based on either the one- or two-year averages. Second, we are mindful that our RFR plus debt premium approach produces a cost of debt for BT Group that is above current yields, and while it is within the plausible range for the overall cost of debt when considering embedded debt, it is above the mid-point of that range. Because of this, we consider that a debt premium of 1.2% remains appropriate for BT Group.

A30.169 The resulting pre-tax nominal cost of debt for BT Group is 5.5%, representing the sum of the nominal RFR of 4.3% and the debt premium of 1.2%.

Disaggregation of BT Group asset beta

June 2015 LLCC Consultation

A30.170 In the June 2015 LLCC Consultation we used an Openreach copper access asset beta of 0.50 (the same as the June 2014 FAMR Statement) and a BT Group asset beta (estimated by NERA) of 0.74. Based on weights of 25%/75% for Openreach and the RoBT, the implied RoBT asset beta was 0.82.

A30.171 We noted that this was higher than the RoBT asset beta applied to leased lines in the 2009 LLCC (0.68³⁷⁶) and the 2013 LLCC (0.74³⁷⁷). We also thought that it would be inappropriate to apply an asset beta of 0.82 to leased lines because we were not convinced that factors driving the increase in the BT Group asset beta (from which the RoBT asset beta is derived), necessarily related to leased lines. We also noted that an asset beta of 0.82 would have been higher than that for other UK, European or US telecoms comparator companies.

A30.172 We presented two options for the asset beta for the LLCC³⁷⁸:

- maintain the status quo – i.e. a two-way split of the BT Group asset beta (which would produce a LLCC asset beta of 0.82, based on the RoBT asset beta); or
- a three-way split of the BT Group asset beta between: (i) Openreach copper access, (ii) BT's Other UK telecoms services and (iii) the remaining RoBT (largely made up of BT's Global Services division); with the leased lines business associated with Other UK telecoms services (which, as well as leased lines, included BT's other telecoms operations associated with fixed voice, broadband and bundled services).

A30.173 We provisionally concluded that in light of the market evidence, it would not seem appropriate to apply an asset beta of 0.82, derived from a two-way split, to leased

³⁷⁶ 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.

³⁷⁷ Figure A14.1, page 348, March 2013 BCMR Statement.

³⁷⁸ Para A9.93 et seq. of the June 2015 LLCC Consultation

lines. Referring to the asset betas for fixed telecoms comparators, we proposed that a reasonable range based on the evidence available at the time would be an asset beta between 0.55 to 0.75 for BT's Other UK telecoms businesses.³⁷⁹ From this range, we proposed an asset beta of 0.75 in order to ensure that the (weighted) sum of parts for the different lines of BT's business summed to the BT Group asset beta and yielded a credible asset beta for the remaining RoBT.

Stakeholder responses

A30.174 BT argued for maintaining the existing two-way disaggregation. FTI (commissioned by BT) considered that the increase in the RoBT beta that we observed may have come about due to our proposal to keep the Openreach beta constant under the two-way disaggregation. It calculated that increasing the Openreach asset beta to 0.6 while using the Ofcom proposed BT Group beta would decrease the RoBT beta to 0.79.³⁸⁰ Using FTI's upper value for the Openreach beta estimate of 0.68 would decrease the RoBT beta to 0.76. Therefore, FTI considered that there may not have been a divergence between BT's UK Telecoms business and the RoBT but rather a mistreatment of Openreach's asset beta that led to the perception of a divergence.

A30.175 FTI considered that while it may be theoretically correct to consider a further disaggregation, the market evidence we provided to support this was primarily hypothetical. As such, FTI did not share our view that market evidence pointed towards a three-way split of the BT Group asset beta.

A30.176 FTI thought that our comparator analysis for BT's Global Services asset beta was flawed because it was based on a limited sample of four ICT companies whose business models were not similar to Global Services, which operate in different markets (primarily more globally than BT) and was subject to selection bias.

A30.177 FTI stated that the UK, European and US telecoms comparators were not 'pure play' because:

- they had different business models to BT, a considerable proportion of their income was from non-fixed line services and they face different regulatory risks from BT in the UK. FTI further noted that as part of its recent energy review, the CMA expressed caution in considering betas from overseas countries in the comparator analysis;
- the spread of asset betas from the comparator sample was large, ranging from 0.30 to 0.81 and there was also a large difference between the two year and one year betas. This led FTI to be concerned about the correctness of calculating an average from this data; and
- the betas had been particularly volatile in recent times, in FTI's view potentially reflecting the financial crisis, and might therefore not be particularly meaningful in the context of a forward-looking beta.

A30.178 FTI concluded that we should use an asset beta of 0.79 for the RoBT.

A30.179 TalkTalk strongly supported our three-way disaggregation, which, in its view offered a better reflection of the risk facing different parts of BT's overall business

³⁷⁹ Paragraph A9.97, June 2015 LLCC Consultation.

³⁸⁰ FTI report, para 1.13

particularly leased lines. TalkTalk thought that we had rightly identified that the rise in the BT Group beta did not appear to be linked to developments in the leased lines market.

A30.180 However, TalkTalk thought that we had defined Other UK telecoms services too widely and had included some high risk activities for example the sports channel, which had no meaningful similarities with the business of offering wholesale leased lines.

A30.181 TalkTalk considered that other UK telecoms services should instead be confined to all non-copper regulated wholesale products (whether in Openreach or BT Wholesale). It would therefore be a beta for an upstream wholesaler of telecoms services in the UK, which is a much more focused reference point for determining the cost of capital for BT's leased line business (and other regulated products).

A30.182 TalkTalk considered that in some respects the UK utility comparators would have higher risk than Openreach since they face competition in many parts of their business (e.g. retail) and unlike BT regulated services face both material input and output price volatility (e.g. in electricity and gas prices). Accordingly TalkTalk considered that the 0.50 asset beta assumed for Openreach is too high and that in setting the Openreach copper access asset beta the BT Group beta was almost irrelevant because Openreach faced lower risk than the retail activities of which it sat upstream.

A30.183 TalkTalk thought that if other UK telecoms was redefined to include only regulated wholesale activities then it would have a lower beta than the UK telecoms comparators

A30.184 TalkTalk contended that it was appropriate for Ofcom to reduce the weight given to Openreach's copper business when comparing the betas for different parts of BT with the overall BT Group beta. TalkTalk believed that the regulatory net replacement cost to enterprise value (NRC/ EV) was the most appropriate measure of the weight of Openreach copper and other units within BT Group. TalkTalk argued that the MCE measure should not be used in Ofcom's assessment of weights.

A30.185 Sky considered the closest comparator group to the Openreach copper network, in terms of systematic risk, were the UK network utilities and, to a lesser extent the European fixed telecoms operators. As a consequence, Sky expected an appropriate asset beta for Openreach copper to lie in the range 0.40-0.44.

A30.186 Further, Sky thought that It could be argued that, because the pricing of and returns on Openreach's copper network were largely known in advance, and less subject to input cost fluctuations than some network utility prices (such as wholesale gas prices), Openreach copper network earnings could be more stable than some network utilities and exhibit lower systematic risk.

A30.187 Sky noted that the European telecoms operators considered by Ofcom primarily include the fixed line incumbents of eleven European markets. Aside from the UK network utilities, Sky thought that the systematic risk of these companies was likely to most closely resemble the Openreach copper network, as each group owns significant fixed access telecoms infrastructure. However, Sky stated that the asset betas of each of the European telecoms operators also included the impact of the retail fixed and mobile business of each operator and therefore exhibited greater systematic risk than faced by the Openreach copper network.

A30.188 Sky considered that while Ofcom's proposed disaggregation was a step in the right direction, in order to achieve the aims set out in the consultation document we should have gone further, and estimated separate WACCs for leased lines (to be used in the leased line charge control) and for other UK telecoms assets (to be used in VULA margin regulation).

A30.189 Vodafone considered that our suggested approach to disaggregate BT Group into three groups of activities rather than two appeared broadly reasonable. However the choice of the three groups of activities did not reflect NERA's analysis of the potential factors driving BT Group's overall increase in asset beta because the "other UK Telecoms services" group of activities included, for example, BT Sports. In addition no adjustment was made for the impact of the BT Pension Fund on the cost of capital for BT Group (Vodafone thought that there were strong reasons to consider that the effect of the pension scheme was to increase the observed beta of BT Group).

A30.190 Vodafone suggested a more reasonable disaggregation would be to split BT into three sets of activities:

- Openreach copper access (LLU and WLR);
- UK business and wholesale (Leased lines, BT Wholesale, BT Business and FTTC); and
- Rest of BT (BT Consumer (including Sports), BT Global Services, Other and BT Pension Scheme).

A30.191 Vodafone noted that explicitly determining the weight to be attached to these three groups, which should reflect market valuations of each activity, was challenging and noted the issues with using mean capital employed. Vodafone concluded that the evidence points to an increased weight being assigned to more risky activities which should not be included with leased lines for the determination of BT's cost of capital.

A30.192 Vodafone considered that the asset beta used for the LLCC of 0.75 was:

- well above averages for comparator companies in the UK, the EU and US with only one company in the sample with a higher asset beta – Comcast – whose beta was likely to have been inflated by M&A activity and which was not a good comparator for the leased lines business.
- at the upper end of the range of 'UK telecoms' asset betas (a sample of three companies). This upper bound was effectively the asset beta for COLT which derived less than 30% of its revenues from the UK and a significant proportion of its revenues from IT services which Vodafone thought were more akin to the activities of BT Global Services.

A30.193 Vodafone concluded that:

- BT Group's asset beta should be 0.60 to 0.65 (reflecting the longer run asset beta and adjusting for the pension scheme);
- an asset beta for Openreach should be in the range 0.45 to 0.50;
- a higher weighting should be given for the RoBT; and therefore

- an ‘other telecoms’ beta, should be applied to Leased Lines of 0.60 to 0.65.

A30.194 [381] argued that the estimated WACC was too high for what it considered to be BT’s monopoly telecommunications utility infrastructure. The fact that BT’s beta was at the upper end of UK and US comparators should give Ofcom pause for thought.

A30.195 GTC considered that our estimate of Openreach’s beta was above all benchmark utilities and that the asset beta estimated for BT Group was above that of many comparable European Telecoms operators. In GTC’s view, the asset betas of smaller UK competitors to BT were not as reliable benchmarks for the Openreach asset beta. Instead, more weight should be given to the asset betas from European regulated telcos and other regulated UK utilities.

Our analysis

Disaggregation for Openreach copper access

A30.196 Our starting point for disaggregating the BT Group beta is to consider appropriate comparators for BT’s Openreach copper access business.

A30.197 In the following sub-sections we present the results for UK network utilities and telecoms comparators (UK and overseas).

A30.198 Using data to 31 October 2015, NERA 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 and a World Index using a debt beta of 0.1.³⁸¹

UK network utilities

A30.199 NERA has calculated that the two-year asset beta for five UK network utilities ranged from 0.42 to 0.58, with an average of 0.46.³⁸² As can be seen from Table A30.14 and Figure A30.9 below, the asset betas of the network utilities have all increased, both on a one-year and a two-year basis. The increase in the two-year asset betas began around early 2014 and has continued steadily upwards since then.

Table A30.14: Asset betas for UK network utilities

	Asset beta v All Share				Average gearing	
	31 October 2015		31 January 2015		31 October 2015	
	1 year	2 year	1 year	2 year	1 year	2 year
National Grid	0.48	0.45	0.44	0.41	44%	45%

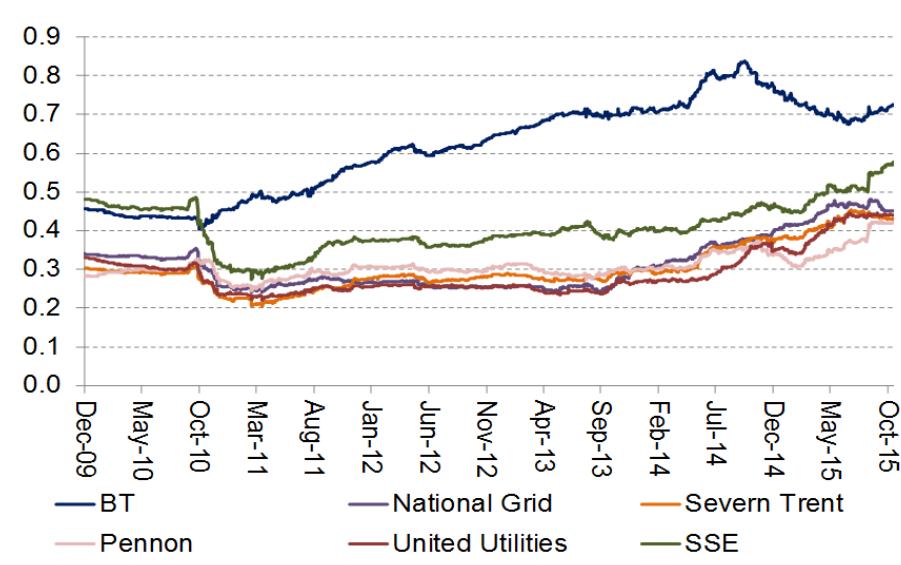
³⁸¹ For UK companies the ‘home’ index is the FTSE All Share. For European companies it is the FTSE All Europe and for US companies it is the S&P500. A debt beta of 0.1 is used consistent with our decision above to assume a debt beta of 0.1 for BT Group.

³⁸² The five network utility comparators all have significant regulated assets. National Grid, United Utilities and Severn Trent generate more than 90% of profits from regulated activities, while for Pennon Group the proportion exceeds 70%. SSE generates around 55% of profits from regulated activities.

Severn Trent	0.44	0.43	0.43	0.38	49%	50%
Pennon Group	0.44	0.42	0.33	0.31	46%	48%
United Utilities	0.46	0.44	0.40	0.34	51%	52%
SSE	0.64	0.58	0.44	0.45	29%	30%
Average	0.49	0.46	0.41	0.38	44%	45%

Source: NERA Final Report Table 3.2 and NERA first report Table 3.2. Calculated using a debt beta of 0.1 using data up to 31 October and 31 January 2015. Note that Centrica was included in the sample of utility comparators in NERA's first report but excluded from NERA's final report because Centrica does not own network assets that are subject to price control regulation, and its main business activity includes electricity and gas retail (and generation), which exposes Centrica to market risk (see page 6 of NERA's final report)

Figure A30.9: Two-year asset betas for UK network utilities and BT Group



Source: Figure 3.5, NERA final report.

UK telecoms operators

A30.200 NERA has calculated that the two-year asset beta for TalkTalk is 0.60; for Sky is 0.61 and for Vodafone is 0.77. In the June 2015 LLCC Consultation we also referenced Colt, with a two-year asset beta of 0.75, but this company has now been de-listed. In order to retain sufficient UK comparators and because it is a major UK-listed telco, we have also included Vodafone. We recognise that it has historically been predominantly a mobile operator, but with the acquisition of Cable & Wireless Worldwide in 2012 it has fixed telephony assets in the UK.

A30.201 Table A30.15 below shows that compared to the first NERA report, on average the two-year asset betas are little changed (with TalkTalk decreasing slightly; Sky increasing slightly). However, from Figure A30.10 below, it can be seen that the UK telco asset betas have generally been increasing since early 2014 (with the exception of BT Group which has declined since late 2014).

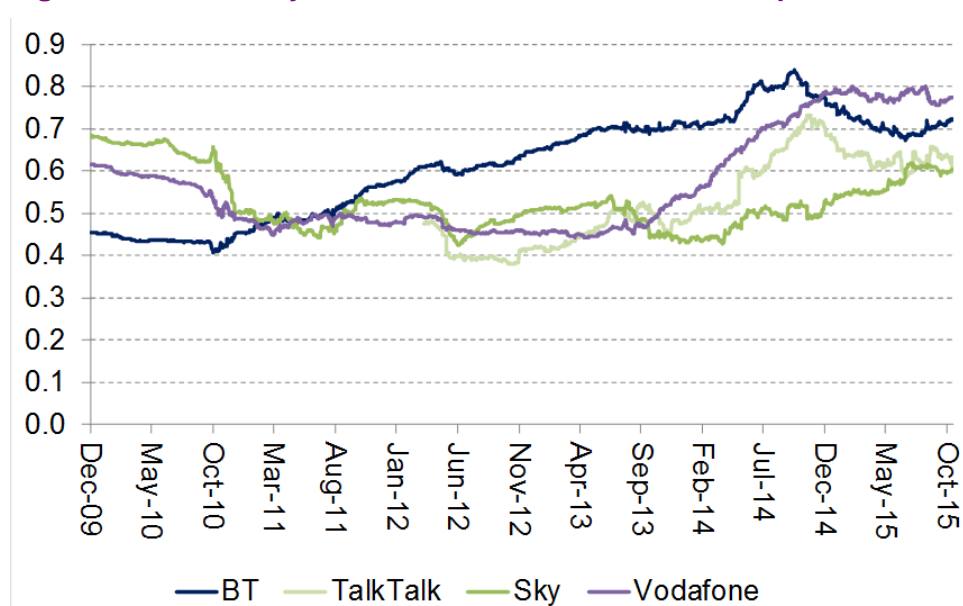
Table A30.15: Asset betas for UK fixed telecoms operators

	Asset beta v All Share	Average gearing
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	31 October 2015		31 January 2015		31 October 2015	
Company	1 year	2 year	1 year	2 year	1 year	2 year
TalkTalk	0.57	0.60	0.58	0.65	16%	15%
Sky	0.60	0.61	0.61	0.55	29%	23%
Colt	Delisted	Delisted	0.74	0.75	0%	0%
Vodafone	0.72	0.77	n/a	n/a	36%	34%
Average	0.63	0.66	0.64	0.65	27%	24%

Source: NERA Final Report Table 3.2 and NERA first report Table 3.2. Calculated using a debt beta of 0.1 using data up to 31 October and 31 January 2015. Colt was delisted on 10 September 2015. Colt gearing levels are as at 31 January 2015

Figure A30.10: Two-year asset betas for UK telecoms operators and BT Group



Source: Figure 3.6, NERA final report

European telecoms operators

A30.202 NERA has calculated the two-year asset betas for European telcos against the “home” index as ranging from 0.34 to 0.79, with an average of 0.54. Against the All World Index, the range is 0.34 to 0.86, with an average of 0.65.

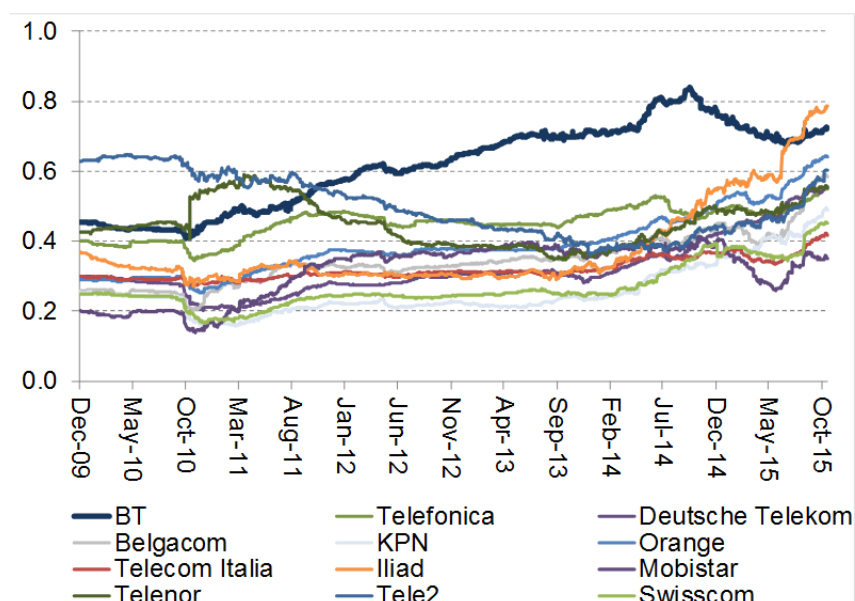
A30.203 As can be seen in Table A30.16 below, whether calculated on the All Europe or the All World Index, the asset betas of nearly all European telcos are higher than in the first NERA report (by around 0.1). The upwards trajectory in European telecoms betas is best seen in Figure A30.11, which shows that the increase began in early 2014, i.e. at a similar time to the increase seen in UK telcos.

Table A30.16: Two-year asset betas for European telecoms operators

	2 year asset betas				Average gearing	Non-mobile revenue %
	31 October 2015		31 January 2015		31 October 2015	
Company	Europe	World	Europe	World		
Telefonica	0.55	0.67	0.50	0.64	51%	34%
Deutsche Telecom	0.55	0.81	0.44	0.67	47%	n/a
Belgacom	0.59	0.71	0.43	0.58	21%	63%
KPN	0.49	0.60	0.37	0.50	50%	33%
Orange	0.64	0.75	0.53	0.68	53%	39%
Telecom Italia	0.42	0.46	0.37	0.46	69%	68%
Illiad	0.79	0.86	0.56	0.61	10%	34%
Mobistar	0.34	0.34	0.35	0.40	36%	10%
Telenor	0.55	0.71	0.48	0.64	22%	16%
Tele2	0.60	0.72	0.42	0.57	18%	28%
Swisscom	0.45	0.50	0.38	0.45	25%	44%
Average	0.54	0.65	0.44	0.56	37%	n/a
BT	n/a	0.65	n/a	0.64	22%	100%

Source: NERA Final Report Table 3.4 and NERA first report Table 3.4. Calculated using a debt beta of 0.1 using data up to 31 October and 31 January 2015. Non-mobile revenue used as an illustrative proxy for revenue derived from mobile operations (note that BT did not own EE as at 31 October 2015).

A30.204 When compared on a “home” index basis, the BT Group asset beta of 0.72 (against the FTSE All Share) is noticeably above that of the European telcos which average 0.54 (against the All Europe index). However, when compared against the All World index, the two-year BT Group asset beta of 0.65 is the same as the average of the European telcos.

Figure A30.11: Two-year asset betas for European telecoms operators and BT Group

Source: Figure 3.11, NERA final report

US telecoms operators

A30.205 NERA has calculated that the two-year asset betas for US telcos against the “home” index (i.e. S&P500) ranges from 0.46 to 0.48, with an average of 0.47. Against the All World Index, the range is 0.51 to 0.54 with an average of 0.53.

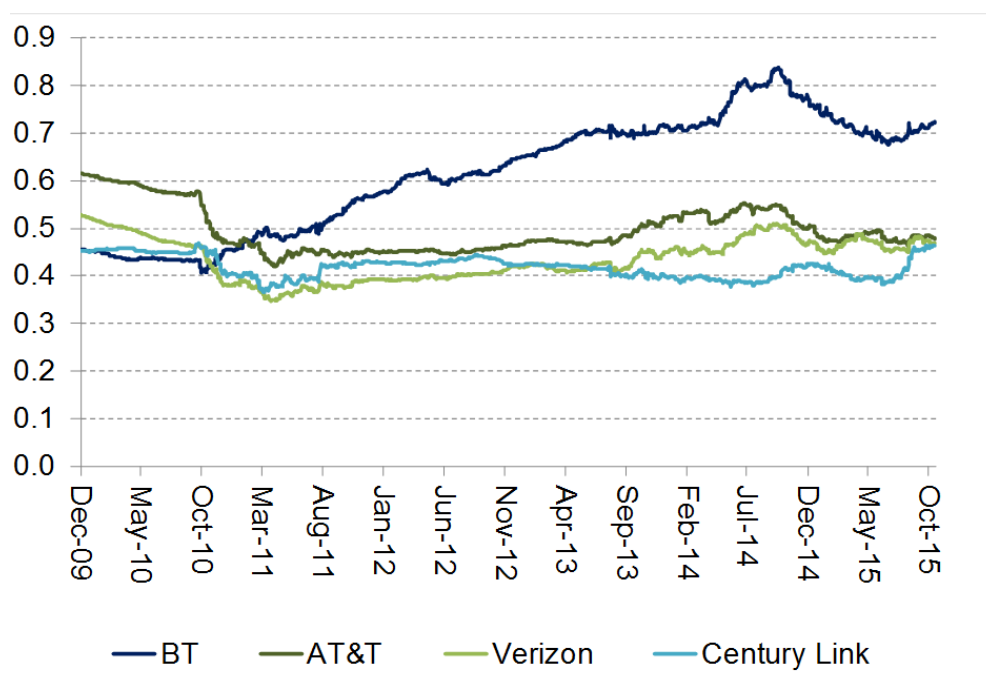
A30.206 For the three US telcos reported below, Figure A30.12 shows that against the “home” index, the asset beta has been broadly flat for a significant period of time.

Table A30.17: asset betas for US telecoms operators

	2 year asset betas				Average gearing	Non-mobile revenue %
	31 October 2015		31 January 2015		31 Oct 2015	
Company	S&P500	World	S&P500	World		
AT & T	0.48	0.53	0.47	n/a	32%	46%
Verizon	0.47	0.51	0.45	n/a	37%	33%
Century Link	0.46	0.54	0.41	n/a	52%	n/a
Average	0.47	0.53	0.44 (0.54)*	n/a	n/a	n/a
BT	n/a	0.65	n/a	0.64	22%	100%

Source: NERA final report Table 3.6 and NERA first report 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 fixed operations.

*The NERA final report notes that “The US sample has changed since our January update, as we have relocated Comcast and Time Warner Cable to the pay TV sample, since they source a greater share of revenues from TV distribution rather than standard telecoms services” (page 28). The inclusion of these companies increased the average asset beta, such that it was reported as 0.54. The 0.44 reported above is the average for three companies retained in the final NERA report.

Figure A30.13: Two-year asset betas for US telecoms operators and BT Group

Source: Figure 3.15, NERA final report

Conclusion on Openreach copper access asset beta

A30.207 While we would expect Openreach to face lower systematic risk than BT Group, we consider that it may face greater systematic risk than other UK network utilities.

A30.208 As shown in Figure A30.9, UK network utility asset betas have steadily drifted upwards since early 2014. The two-year average asset beta for network utilities is now 0.46 (based on the FTSE All share and a debt beta of 0.1). Shortly after UK network utility asset betas trended upwards, the BT Group asset beta began to decline and its two-year asset beta now stands at 0.72.

A30.209 The upwards movement in the asset beta of comparator companies is not confined to UK network utilities. As shown in Figures A30.10 and A30.11 UK and European telco asset betas have also been steadily increasing since we last estimated the asset beta for Openreach (i.e. in the June 2014 FAMR statement), with only US telcos being relatively flat.

A30.210 Because of the steady upwards movement in the asset betas of comparator companies (network utilities and UK and European telcos) in the last two years, we consider that an upwards revision to our estimate of the asset beta for Openreach is appropriate.

A30.211 Much as we did in the June 2014 FAMR statement³⁸³, we have looked at whether the mid-point between the BT Group and network utility asset betas (i.e. 0.59) is a reasonable starting value for the purposes of asset beta disaggregation.³⁸⁴ We now consider whether it would be appropriate to shade this asset beta of 0.59 up or

³⁸³ Paragraphs A14.216 to A14.219 of the June 2014 FAMR Statement.

³⁸⁴ The mid-point between the average utility 2-year asset beta of 0.46 and the BT Group 2-year asset beta of 0.72 is 0.59.

down by reference to other relevant factors in order to estimate an asset beta for Openreach.

- *Comparison with asset betas for UK telecoms providers:* We note that an Openreach asset beta of around 0.59 is similar to the current two-year asset beta for Sky (0.61) and TalkTalk (0.60). These asset betas for Sky and TalkTalk suggest shading down the asset beta for Openreach on the grounds that Sky and TalkTalk might be expected to face somewhat higher systematic risk (since they sell more usage dependent services downstream from Openreach, not just fixed lines).
- *Comparison with asset beta of Chorus.* In the June 2014 FAMR Statement we considered the asset beta of Chorus, New Zealand's vertically separated telecoms network operator when assessing the Openreach asset beta because Chorus shares some similarities to the copper access part of Openreach.³⁸⁵ The New Zealand Commerce Commission (NZCC) recently published its price determination for Chorus' unbundled copper local loop and bitstream access services. This included a report from Oxera which estimated that the asset beta for Chorus was between 0.35 and 0.52 against the home index (New Zealand index), depending on whether daily or weekly frequencies were used.³⁸⁶ Assuming that the Chorus asset beta estimated against the New Zealand index is comparable to an Openreach/BT asset beta calculated against the FTSE All Share index (and we note there may be limitations in undertaking such a comparison)³⁸⁷, this also suggests that the asset beta for Openreach should be shaded down from 0.59.
- *BT pension scheme effect:* allowing for the effect of BT's defined benefit pension scheme means that we might expect the Openreach asset beta to be somewhat higher than that of a company without such a defined benefit pension scheme. For example, in our December 2010 Pension Review Statement we considered, in light of expert advice, that BT's asset beta could be higher than otherwise by around 0.05, but that there was no robust way of estimating this effect.³⁸⁸ This effect could potentially offset the preceding two factors to an extent since we do not propose carving out the BT Pension Scheme (contrary to Vodafone's suggestion).³⁸⁹

A30.212 In light of the above we consider that while it is appropriate to increase the Openreach asset beta from the value of 0.50 used in the June 2014 LLU WLR Statement, we propose shading down from the mid-point of the range between the

³⁸⁵ Chorus supplies unbundled loops and backhaul and controls the network assets needed for those services, while Spark New Zealand supplies all active services.

³⁸⁶ Table 3, Cost of Capital for the UCLL and UBA pricing reviews, NZCC, 15 December 2015.

³⁸⁷ <http://www.comcom.govt.nz/dmsdocument/13936>

Page 8 of NERA's final report notes that "in comparing betas for companies from different jurisdictions, a like-for-like comparison can only be done if using a consistent index across companies, i.e. the world index". Pages 33-35 of NERA's final report discusses how betas measured against different home indices can be affected in different ways by the underlying beta components.

³⁸⁸ See para 7.33-7.48 of Ofcom pensions review, December 2010 statement,

<http://stakeholders.ofcom.org.uk/binaries/consultations/btpensions/statement/statement.pdf>.

³⁸⁹ The reason for this is that we disallow deficit repair payments in charge controls. Therefore, we implicitly accept that BT's shareholders bear the risk and rewards of the pension scheme. In this context it is inconsistent to exclude the attendant risk of the scheme from the asset beta and the cost of capital. This point was made at para 7.61-7.63 of the Ofcom pensions review, December 2010 statement, <http://stakeholders.ofcom.org.uk/binaries/consultations/btpensions/statement/statement.pdf>.

network utility average asset beta and that of BT Group. In our view an asset beta of 0.55 appropriately reflects the upwards trend in the asset beta of both network utilities and most UK and European telcos, but keeps the Openreach asset beta below that of downstream telecoms providers yet within the top-end of the range of UK network utilities.

RoBT asset beta from a two-way disaggregation

A30.213 In order to estimate the RoBT asset beta under a two-way disaggregation we have previously specified the weightings to apply to each part of BT Group so that the constituent asset betas sum (on a weighted basis) to the BT Group asset beta.

A30.214 In the June 2015 LLCC Consultation we assigned a weighting of 25% to the Openreach copper access business, which was lower than the 33% applied in the June 2014 FAMR statement. Table A30.18 below reports weightings for 2012/13, 2013/14 and 2014/15 based on MCE, EBITDA and NRC/EV for Openreach copper access as a proportion of BT Group.

Table A30.18: Weightings for Openreach copper access

	2012/13	2013/14	2014/15
	<--Data used for June 2015 LLCC Consultation-->		
	<--Data used for January 2016 statement-->		
MCE	61%	55%	48%
EBITDA	28%	25%	28%
Regulatory NRC/EV	29%	24%	20%

Source: Ofcom.³⁹⁰

A30.215 We recognise that BT completed its acquisition of EE on 29 January 2016 which means that in the future BT's Openreach copper access activities will represent a lower proportion of BT's economic value. However, BT did not own EE during the period over which we estimated the asset beta (the two year period ending 31 October 2015).³⁹¹ We therefore have not taken into account BT's acquisition of EE when estimating the weighting to apply to BT's Openreach copper access activities.

³⁹⁰ 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 at the year-end as reported by Bloomberg.

³⁹¹ BT announced the acquisition of EE on 5 February 2015 and its shareholders approved the acquisition on 30 April 2015. However, completion of the acquisition was subject to a number of conditions including clearance of the acquisition by the CMA (granted on 15 January 2016). In addition, the circular published by BT on 30 April 2015 set out that the deal could have been terminated if BT recommended an alternative transaction prior to completion (which would have resulted in a payment of £250m from BT to Orange and Deutsche Telekom (DT), the previous owners of EE) or if a material adverse change had occurred affecting either EE or BT. The acquisition was also subject to a cap and collar mechanism whereby the final amount paid by BT depended in part on movements in BT's share price prior to the completion date (<https://www.btplc.com/Sharesandperformance/AGMs/Generalmeeting2015/Circular.pdf>). Finally, it was reported on 27 January 2016 that EE would pay a final dividend of £263m to DT and Orange

A30.216 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 the weight of Openreach copper access within BT appears to be broadly in the range of 20% to 30%. On this basis we consider that the weighting of 25% proposed in the consultation remains appropriate.

A30.217 Based on the BT Group asset beta of 0.72, an Openreach copper access asset beta of 0.55 and a weighting of 25%, the derived RoBT asset beta under a two-way disaggregation would be 0.78.

A30.218 In the June 2015 LLCC Consultation we considered that the evidence on comparator companies, coupled with the three factors below, indicated that the RoBT asset beta from a two-way disaggregation (then 0.82) did not seem appropriate for leased lines. We now estimate that the RoBT asset beta from a two-way disaggregation would be 0.78 which remains higher than that applied to leased lines in 2013 (0.74) and in 2009 (0.68) and is higher than a number of telecoms comparators. Therefore, in the following sub-section we consider whether further disaggregation along the lines proposed in the consultation would be appropriate.

Framework for considering further disaggregation

A30.219 The three factors we have used to evaluate the case for disaggregation remain as set out in the consultation (and repeat those used in the 2005 WACC Statement in which we first disaggregated the BT WACC), namely whether:

- there are a priori reasons for why the systematic risk faced by the business in question would be different from that of the overall company;
- there is evidence available to assess variations in risk; and
- correctly identifying variations in risk, reflected in an adjusted rate of return, would be likely to bring about gains for consumers.

A priori reasoning on differences in systematic risk

A30.220 On the first of the above factors, we remain of the view that BT's leased lines business may well face different systematic risk from other business within the RoBT.

A30.221 In this regard, we note that stakeholders (such as TalkTalk, Sky and Vodafone) have variously argued that the three-way disaggregation proposed in the June 2015 LLCC Consultation should have gone further, with either a separate asset beta for leased lines entirely, or at least a more narrowly focused "Other UK Telecoms" segmentation.

A30.222 On this point we have some sympathy in that under a two-way disaggregation, the RoBT comprises 75% of BT Group activities, only a subset of which would be

prior to the completion of the acquisition. In light of the above points we do not consider that that BT can be said to have owned EE prior to the completion of the acquisition on 29 January 2016.

leased lines (around 5-15% of BT Group depending on whether we take revenue, EBITDA or the NRC to EV ratio as the relevant metric³⁹²).

A30.223 Conversely, FTI (on behalf of BT) argued that “...*whilst it maybe theoretically correct to consider a further disaggregation, the market evidence provided by Ofcom to support this is primarily hypothetical [...] Furthermore, while it is theoretically correct to disaggregate the beta further, there is not the data available for pure-play comparators to permit this disaggregation in practice*”.³⁹³

A30.224 A priori reasoning in principle points towards disaggregating the BT Group asset beta to a level that most closely matches the set of products which are the subject of the review. However, we consider that the appropriateness of further disaggregation depends on whether the available data allows us to confidently identify, directly or indirectly, variations in systematic risk.

Evidence to assess variations in risk

A30.225 In the June 2015 LLCC Consultation we looked for various indicators to inform our understanding of the risk underlying BT's leased lines business. For example, we looked at variations in actual and forecast volumes for different groups of services in BT.³⁹⁴ The data indicated that i) Openreach copper access rental volumes showed little monthly variability, ii) leased lines rental volumes were more variable than Openreach copper access rentals and (iii) similar to the variability for other regulated services such as WBA and ISDN. However, volume data was not available for all parts of BT, such as TV content or Global Services, and we considered it could only give an indication of total risk. i.e. systematic and company-specific risk combined. This volume data was a useful qualitative indicator of the risk of leased lines and other fixed telecoms usage services compared to Openreach copper access services, but it was not sufficiently robust to estimate a unique asset beta at a more granular level.³⁹⁵ Therefore, we have not sought to update the volume analysis for this statement.

A30.226 We then turned to evidence from potential comparator companies. Given that a pure-play leased lines business did not exist, we looked at telecoms comparators and ICT comparators (as proxies for BT's Global Services division). Respondents in favour of a further disaggregation of the RoBT asset beta tended to support the disaggregation of BT's ICT services, but also considered that BT's Pay TV operations could be higher risk than the other telecoms operations in RoBT (including leased lines).

A30.227 In order to improve the information on comparator companies, we commissioned NERA to identify further suitable comparators for BT's ICT and pay TV operations. We set out the asset betas estimated by NERA for ICT and pay TV comparators below.

A30.228 NERA's report identifies that BT's Global Services ICT division provides services in three main areas: i) managed networked IT services and security, ii) unified

³⁹² As a proportion of BT Group, leased lines services represent 15% of EBITDA, 6% of revenue and 6% of NRC /EV 2014/15. These ratios are comparable to the 2013/14 ratios reported in Table A9.13 of the June 2015 LLCC Consultation.

³⁹³ Para 1.4 and 1.15, FTI report.

³⁹⁴ Tables A9.14 and A9.15, June 2015 LLCC Consultation.

³⁹⁵ Paragraphs A9.72-A9.74 of the June 2015 LLCC Consultation.

communications and IT infrastructure and iii) Professional services and IT consultation. NERA identified 17 comparators that focus on two of the three main lines of business provided by Global Services, of which nine operated in all three areas. NERA therefore created two tiers of comparators:

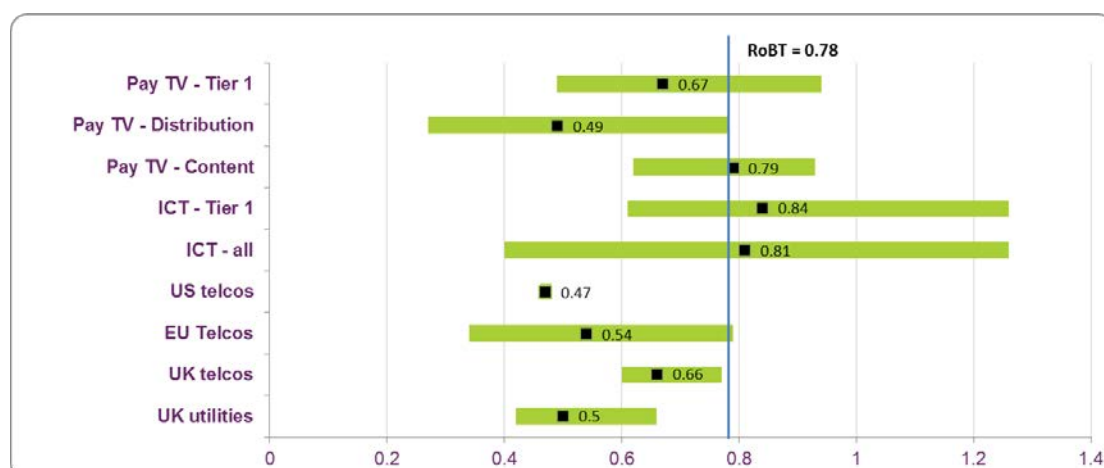
- “Tier 1” comparators that are active across all three main business areas in Global Services. The average 2-year asset beta for this group is 0.84 against the home index and 0.96 against the world index; and
- “Tier 2” comparators that are active in two of the three main business areas in Global Services. The average 2-year asset beta for this group is 0.81 against the home index and 0.90 against the world index.

A30.229 NERA’s report indicates that not all TV operators are active across all parts of the value chain. NERA identified comparators that i) provide entertainment content, ii) distribute TV content on cable and satellite; and iii) provide content and distribute that content. NERA identified 14 Cable & Satellite comparators (i.e. TV distribution providers), 12 Entertainment Content comparators and 6 which engage in both content production and distribution (“Tier 1 pay TV comparators”). The asset betas estimated by NERA were:

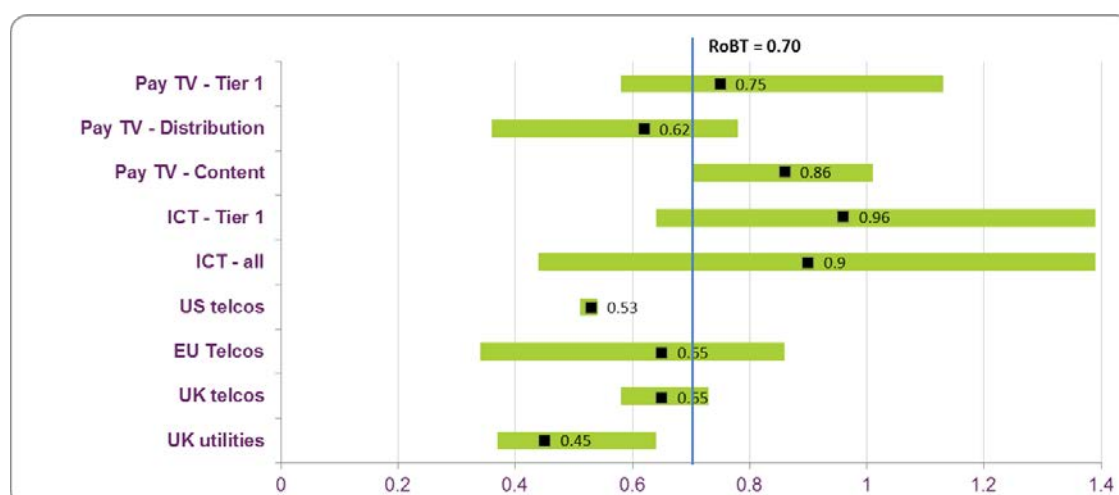
- Tier 1 pay TV operators: the average 2-year asset beta for this group is 0.67 against the home index and 0.75 against the world index;
- Entertainment Content: the average 2-year asset beta for this group is 0.79 against the home index and 0.86 against the world index; and
- Cable & Satellite: the average 2-year asset beta for this group is 0.49 against the home index and 0.62 against the world index.

A30.230 Figure A30.13 and Figure A30.14 below show the min-max range and average asset betas for the ICT and pay TV comparators described above, as well as the UK, European and US telecoms comparators discussed earlier. Asset betas calculated by reference to the “home” index are presented in the first chart and are compared with the RoBT asset beta of 0.78. The second chart shows the asset betas using a consistent index across all companies, i.e. the FTSE All World Index. This forms our preferred basis of comparison for companies listed in different jurisdictions for the reasons explained by NERA.³⁹⁶ In the second chart, the RoBT asset beta is expressed by reference to the FTSE All World by scaling the RoBT asset beta by the ratio of the FTSE All World to FTSE All Share asset betas for BT Group (i.e. 0.65 / 0.72) to yield an implied asset beta of 0.70 .

³⁹⁶ See NERA final report, section 2.2

Figure A30.13: “Home” index asset beta comparisons

Source: Two-year daily asset betas from Tables 3.2, 3.4, 3.6, 4.2 and 5.1 in the NERA report. NERA assumes the following home indices: For UK companies the FTSE All Share; for European companies the FTSE All Europe; for US companies the S&P500.

Figure A30.14: World Index asset beta comparisons

Source: Two year daily asset betas from Tables 3.2, 3.4, 3.6, 4.2 and 5.1 in the NERA report. All asset betas estimated using the FTSE All World index.

A30.231 The above data suggests that while there is a range of uncertainty in identifying the asset betas for different businesses, on average a telco is likely to exhibit a lower asset beta than an ICT business. The average two-year asset beta for telcos is 0.63 (calculated across UK, European and US telcos and based on the All World Index), whereas for Tier 1 ICT businesses it is 0.96 (based on the All World Index). While the ranges overlap to some extent, the range for the ICT comparators in particular is wide, which implies some uncertainty in coming to a point estimate for these companies.

A30.232 The average Tier 1 pay-TV businesses have an asset beta of 0.75 against the FTSE All World Index, which is relatively close to the telco average asset beta (of 0.63) against the FTSE All World Index. We also note that the asset beta for Sky, which is arguably the closest UK pay-TV comparator company to BT, has an asset beta of 0.61 against the FTSE All Share index and 0.58 against the FTSE All World index.

A30.233 On this basis we consider that while there is sufficient evidence to suggest that ICT activities will tend to be associated with higher systematic risk than standard telecoms, it is less clear cut that a typical (vertically integrated) pay-TV business will be associated with higher systematic risk.

A30.234 Turning to the asset beta of telecoms companies, in the June 2015 LLCC consultation we proposed an asset beta range between 0.55 to 0.75 which we used as the benchmark range for BT's Other UK telecoms services (including leased lines). Based on the latest comparator two-year asset betas presented above we observe that the lower end of the range is now slightly above the US telco average (0.47 based on the "home" index of the S&P 500) and very close to the average of the European telcos (0.54 measured on the "home" index, i.e. the FTSE All Europe). The upper end of the range is broadly consistent with the higher UK telco asset betas (previously Colt at 0.75 and now Vodafone at 0.77, both based on the FTSE All Share).

A30.235 While comparisons with overseas listed companies are difficult and should ideally be made using a consistent market index, we do not consider that the range above would be particularly sensitive to the choice of index. For example, using the All World Index, the US telco average remains just below the lower end of the range (which at 0.53 is if anything more consistent with the 0.55 lower end reported in the consultation) and at the upper end of the range we observe that Vodafone's asset beta against the FTSE All World is 0.73. Against the All World Index, we also note that only two European telcos (Deutsche Telekom and Iliad) out of the sample of 11 have an asset beta greater than 0.75.

A30.236 Therefore, we consider that an asset beta range for telecoms services of 0.55 to 0.75 remains reasonable. On this basis, the RoBT asset beta from a two-way disaggregation of 0.78 lies outside the benchmark range for a typical telecoms business, albeit slightly. We consider that at least in part this is likely to be due to the contribution of the higher risk inherent in ICT activities which on a two-way disaggregation are included within the RoBT.

Would further disaggregation bring about gains for consumers?

A30.237 In the June 2015 LLCC Consultation, we noted that a lower asset beta and hence WACC would, in the short-term, lead to lower prices to the benefit of customers (i.e. wholesale CPs) and ultimately consumers (in so far as wholesale charge reductions pass-through to retail prices). We also noted that consumers could also be harmed in the long-run if regulated returns are below the appropriate cost of capital, since this will weaken incentives to invest.

A30.238 On this point, we note the importance of investment and innovation in delivering dynamic efficiency. If we were to set the regulated return too low relative to the true cost of capital the detriment from under-investment may exceed the detriment from setting too high a regulated return relative to the true cost of capital. A lower return than the true cost of capital will reduce BT's incentives to invest and innovate in the regulated leased lines business and by restricting prices downstream, could reduce the incentives to invest by other infrastructure providers.

A30.239 Nevertheless, leased lines are also an important input to downstream services, including for various CPs that compete with BT in those downstream markets. In addition, to the extent that wholesale charges feed through to retail prices, charges higher than necessary to compensate investors for the risk inherent in leased lines would be to the ultimate detriment of consumers. Therefore, if a two-way

disaggregation were to yield an asset beta and a WACC that is likely to significantly over-compensate investors for the risk inherent in wholesale leased lines then further disaggregation would be appropriate. In selecting a point estimate for the asset beta and the WACC under any further disaggregation we do, however, need to take into account the implications for innovation and investment noted in the preceding paragraph.

A30.240 Whether further disaggregation is possible will depend on the evidence available as a direct or proxy measure of the risk inherent in the relevant line of business. As explained earlier, we do not have direct evidence on the systematic risk of the leased lines business – in particular, there is no pure play comparator company. Therefore, we explain below whether the weight of evidence from proxy comparators allows us to obtain a more satisfactory asset beta for the regulated line of business than a two-way disaggregation.

Conclusion on asset beta disaggregation

A30.241 In the June 2015 LLCC Consultation we considered that the evidence on comparator companies available at the time, coupled with analysis under the three factors set out above (i.e. a priori reasoning, evidence on risk and the ultimate impact on consumers), indicated that the RoBT asset beta from a two-way disaggregation (then 0.82) did not seem appropriate for leased lines.

A30.242 We now estimate that the RoBT asset beta from a two-way disaggregation would be slightly lower at 0.78 – this reduction being driven by a small fall in the BT Group asset beta and a modest increase in our view of the asset beta for Openreach copper access. Nevertheless, an asset beta of 0.78 is higher than that applied to leased lines in 2013 (0.74) and in 2009 (0.68) and, based on the evidence available at the present time, is higher than for any other UK telecoms comparators (including Vodafone which is predominantly mobile and overseas focused).

A30.243 It is difficult to be certain on the factors driving the systematic risk within the RoBT (on a two-way disaggregation), but we note that the leased lines business is a relatively small proportion of the RoBT. While we do not have evidence on a pure play leased lines comparator, we do have evidence on the likely risk of other parts of the RoBT – notably the ICT line of business and pay-TV. As explained above, the present evidence indicates that the average asset beta for ICT companies appears to be noticeably above that of telcos, while the average asset beta of pay-TV comparators is much closer to that of the telcos.

A30.244 We also consider that the systematic risk inherent in leased lines is likely to be better proxied by the asset beta of predominantly telecoms-focused companies – since these are the major sellers of leased lines. As explained earlier, based on evidence from benchmark telco asset betas, we remain of the view set out in the consultation that a reasonable range at present for the asset beta for UK telecoms services (including leased lines) would be 0.55 to 0.75. We recognise that with the asset beta of Openreach copper access now estimated at 0.55, a case could be made for a slightly increased lower end of the range, perhaps implying a range of 0.60 to 0.75, since we would expect telecoms usage services and leased lines to exhibit slightly higher systematic risk than fixed access connections provided by Openreach.

A30.245 However, this would not change our view on the preferred point estimate for Other UK telecoms. This is because in selecting an asset beta from this range, we have preferred a value towards the upper end. This is for two reasons; first, we wish to

ensure that the value selected for Other UK telecoms (including leased lines) implies a reasonable value for BT's ICT business within the RoBT (see below); second, we are mindful of the consequences of undercompensating investors in the leased lines business.

A30.246 We have decided to use an asset beta for Other UK telecoms of 0.70 (measured against the All Share Index). This is slightly below the value used in the June 2015 LLCC Consultation (of 0.75), but in our view is closer to the asset beta we might expect of a typical UK telecoms operator based on the available evidence. First, excluding BT, the UK telecoms average asset beta is 0.66.³⁹⁷ Second, an asset beta of 0.70 for Other UK telecoms is the value that implies the most satisfactory asset beta for the remaining RoBT (i.e. BT's ICT activities) and we now have better information on ICT comparators than used in the consultation.

A30.247 In the June 2015 LLCC Consultation we proposed a weighting of 15% for BT's Global Services division, alongside a weight of 25% for Openreach and 60% for 'Other UK telecoms'. Table A30.19 shows the proportion of BT Group's EBITDA that relates to each division in 2013, 2014 and 2015. We consider that this data would continue to support a weighting of around 15% for BT's Global Services division.³⁹⁸

Table A30.19: Proportion of total EBITDA represented by each BT division

	2013	2014	2015	Average 2014-15
Global Services	15%	17%	17%	17%
Openreach	43%	43%	41%	42%
BT Consumer	16%	14%	16%	15%
BT Business	15%	16%	17%	16%
BT wholesale	10%	10%	9%	9%
Other	0%	0%	0%	0%
Total	100%	100%	100%	100%

Source: BT's 2015 annual report. The average column is calculated from the underlying data rather than the rounded values from the 2014 and 2015 columns. Note that the Openreach division includes wholesale copper access, wholesale Ethernet leased lines and wholesale fibre broadband products.

A30.248 Based on the previously determined asset beta for Openreach (0.55) the value for Other UK telecoms (0.70) and the BT Group asset beta (0.72), the implied asset beta for BT's ICT services would be 1.08 (by reference to the FTSE All Share Index).³⁹⁹ Converting this to a FTSE All World asset beta based on the ratio of the FTSE All World to FTSE All Share asset beta for BT Group (0.65/0.72), the resulting asset beta for BT's ICT services is 0.98.

³⁹⁷ We also note that the BT Group asset beta is itself 0.72, so if the risk in Openreach copper access offsets the higher risk inherent in BT's ICT business we might expect the asset beta of BT's remaining telecoms services to be close to the BT Group average asset beta.

³⁹⁸ A review of recent analyst reports from UBS and Berenberg indicates that a 15% weighting is also consistent with the proportion of BT's enterprise value that analysts associated with Global Services prior to the acquisition of EE.

³⁹⁹ The weights in this calculation are: Openreach copper access 25% (as before); Other UK telecoms 60%; the remaining RoBT 15%.

A30.249 Such an asset beta value is very close to the average asset beta of Tier 1 ICT comparators in NERA's analysis of 0.96 (measured against the All World Index). While we recognise the range of uncertainty associated with the ICT comparator asset betas, the fact that an asset beta for Other UK telecoms of 0.70 implies an asset beta for BT's ICT services very close to the average for ICT comparators provides reassurance on the reasonableness of our three-way disaggregation in which Global Services is separated from other UK telecoms services.

A30.250 We recognise that, in principle, the asset beta for BT's leased lines business may further differ from that of other businesses within our definition of Other UK telecoms. However, a more granular disaggregation would be difficult based on the evidence available at the present time – for example, we do not consider that the available evidence suggests separating out BT's pay-TV operations from Other UK telecoms.⁴⁰⁰

Disaggregation of BT Group debt premium

Introduction

A30.251 As noted in the June 2015 LLCC Consultation, and consistent with previous charge control statements, we consider that a firm facing lower systematic risk could attract a higher credit rating for a given level of gearing than a firm facing higher systematic risk. This implies that BT's businesses with lower systematic risk (i.e. Openreach copper access) would face a lower cost of debt than the RoBT (at the same level of gearing).

June 2015 LLCC Consultation

A30.252 In the June 2015 LLCC Consultation we applied the lower bound of the debt premium range for BT Group to Openreach copper access (June 2015 LLCC Consultation: 1%) and the upper bound of the range to the RoBT (June 2015 LLCC Consultation: 1.4%).

A30.253 For Other UK telecoms, we proposed to use the same debt premium that we applied to BT Group (June 2015 LLCC Consultation: 1.2%).

Stakeholder responses

A30.254 TalkTalk agreed that the cost of debt for Other UK telecoms would sit between the cost of debt for Openreach and RoBT, but considered that it would also be lower than BT Group.⁴⁰¹

⁴⁰⁰ We note that even if we did have stronger evidence that the asset beta associated with pay TV operations was higher or lower than for telecoms services, disaggregating the RoBT asset beta on this basis may not have a significant impact at the present time because evidence from BT's annual accounts suggests its BT TV operations may currently have a relatively low weight of around 5% in terms of BT's overall economic value (based on an estimate of the proportion of BT Consumer EBITDA that relates to BT's 'Broadband and TV' operations). Given that BT bundles its TV services with broadband products, it may be difficult to robustly disaggregate its pay TV operations from other products.

⁴⁰¹ Paragraph 1.56, TalkTalk response.

Our analysis

A30.255 We have updated our estimation of the debt premium above and remain of the view that the appropriate point estimate is 1.2% for BT Group.

A30.256 We continue to believe that it is appropriate to disaggregate the debt premium to reflect the different underlying risk in BT's different lines of businesses (i.e. Openreach, Other UK telecoms and the remaining RoBT). As explained earlier, our range for the BT Group debt premium is 1.1% to 1.5%. Adopting the same approach as in the consultation, we would apply the lower end of this range (1.1%) to Openreach, the BT Group debt premium of 1.2% to Other UK telecoms and the upper end of the range (1.5%) to the RoBT.

A30.257 We have cross-checked this approach by considering what the debt premium for different parts of BT could be based on inferred credit ratings. As noted above, we consider that Openreach copper access could achieve a higher credit rating and/or a lower debt spread than BT Group (rated BBB) if it issued debt on a stand-alone basis (assuming the same level of gearing).

A30.258 It is difficult to assess precisely what rating Openreach copper access would achieve because the ratings process is complex and requires judgement. Nevertheless, we have examined the credit ratings of regulated energy and water sector companies and noted that the credit ratings ranged from BBB to A, but with a majority clustered around BBB+ and A-. We also noted that these companies had higher gearing than our assumed gearing for BT of 30%.

A30.259 For the purposes of this analysis we have assumed that Openreach copper access could achieve a cost of debt which is between BBB-rated debt and A-rated debt.⁴⁰² In effect this approach assumes that the Openreach copper access credit rating is around one or two notches higher than BT Group's rating.

Table A30.20: Spread between BBB and A benchmark indices (10 years)

	1 year average	2 year average
BBB v A ratings	0.47%	0.53%
UK Utilities BBB v A	0.21%	0.20%

Source: Bloomberg, Ofcom analysis. BBB index is the BVCSGU10 Index from Bloomberg (same as the index used in estimating BT Group's cost of debt). 'A' index is the BVCSGK10 Index from Bloomberg. UK Utilities BBB index is the BVGBUB10 Index from Bloomberg. UK Utilities A index is the BVGBUA10 Index from Bloomberg.

A30.260 Table A30.20 above suggests that the spread between A-rated debt and BBB-rated debt is between 0.20% and 0.53%; the lower figure reflecting UK utility data and the upper figure reflecting all companies. We consider that Openreach is likely to face slightly higher systematic risk than a UK utility. Assuming a one notch uplift to Openreach from the BT Group rating (BBB to BBB+), Openreach might be able to reduce its cost of debt by around 0.07% to 0.18% relative to BT Group⁴⁰³, and

⁴⁰² In effect there are three ratings notches between BBB rated debt and A rated debt

⁴⁰³ There are three ratings notches between BBB rated debt and A rated debt, so one-notch estimates have been derived by dividing the 0.20% to 0.53% range by three.

assuming a two notch uplift (BBB to A-) it might be able reduce its cost of debt by around 0.14% to 0.36%.

A30.261 Any adjustment based on this approach is approximate as it depends on the extent to which Openreach is perceived as utility-like and whether a one notch or a two-notch adjustment is appropriate. An intermediate adjustment (i.e. somewhere between the utility range and other companies and somewhere between a one-or two-notch rating uplift) might imply a debt premium for Openreach around 0.2% lower than BT Group – i.e. around 1.0% compared to BT Group's 1.2%.

A30.262 It is similarly difficult to assess precisely what rating the Other UK telecoms activities would achieve. However, we note that many of the UK and European telecoms comparators described above have similar credit ratings to BT Group so we consider that it would be reasonable to assume under this approach that the Other UK telecoms activities would have a debt premium similar to BT Group; i.e. 1.2%.⁴⁰⁴

A30.263 In order to estimate the debt premium for the new RoBT under a three-way disaggregation, we can use the weightings from the asset beta disaggregation. On this basis, the weightings imply a remaining RoBT debt premium of 1.5%.⁴⁰⁵

A30.264 Table A30.21 compares the result of this credit ratings approach to the approach proposed in the consultation of applying the range of the BT Group debt premium to Openreach and the RoBT and the BT Group debt premium to Other UK telecoms. As can be seen, the debt premium for the line of business of most interest (i.e. Other UK telecoms) would be unchanged under either approach and the debt premium for Openreach and the new RoBT would be similar or the same under the two approaches.

Table A30.21: Summary of alternative approaches to the debt premium

Approach	BT Group	Openreach copper access	Other UK telecoms	RoBT
BT debt premium range	1.2%	1.1%	1.2%	1.5%
Credit rating approach	1.2%	1.0%	1.2%	1.5%

Source: Ofcom calculations, all values rounded to 1 decimal place

Conclusion

A30.265 For the purposes of this statement we have used a debt premium of 1.2% for Other UK telecoms and applied this to leased lines.

A30.266 We have used 1.1% for the debt premium applied to Openreach Copper access and 1.5% for the new RoBT.

⁴⁰⁴ The Bloomberg composite credit rating for BT Group is currently BBB. For Sky it is BBB- and Vodafone BBB+. Many of the European telecoms comparators also have ratings ranging from BBB- to BBB+ (including Orange and Deutsche Telekom).

⁴⁰⁵ $1.0\% \times 25\% [\text{Openreach}] + 1.2\% \times 60\% [\text{Other UK Telecoms}] + 1.5\% \times 15\% [\text{RoBT}] = 1.2\% [\text{BT Group}]$

Conclusion

A30.267 Table A30.22 summarises the resulting pre-tax nominal WACC for BT Group and the three-way disaggregation. We have applied the pre-tax nominal WACC of 9.8% for Other UK telecoms to the final year of the leased lines charge control.

Table 30.22: BT WACC estimates

Approach	BT Group	Openreach	Other UK telecoms	RoBT
Pre-tax nominal WACC	9.9%	8.8%	9.8%	12.4%