Duct and copper valuation

A REPORT PREPARED FOR SKY AND TALK TALK GROUP

October 2011

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Executive Summary

Since the current access network valuation regime was set up in 2005 in the UK, new information supports giving increased weight to regulatory certainty and cost recovery objectives. The focus on cost recovery is consistent with the continued application of the regulatory asset value (RAV) adjustment, which aims to ensure that BT does not over-recover past investments. Even after the application of the RAV adjustment however, the current approach to costing certain access network assets, arguably gives undue weight to setting prices at a competitive level (as costs will converge to a CCA valuation over time). The available evidence on the potential for replicating some parts of the access assets, such as ducts, suggests that there is now a limited case for giving weight to the objective of seeking to emulate a 'competitive level' of prices, based on current cost accounting (CCA). The benefits of using a CCA valuation for these parts of the access network therefore appear limited. Further, the current approach to estimating CCA does not appear to meet the important regulatory objectives of providing transparency and certainty.

There is strong evidence to support Ofcom's proposals to reject BT's CCA valuation of the duct network within the 2010/11 RFS as a basis for the price control. Our independent analysis supports Ofcom's view that BT's valuation is inconsistent with past capital expenditure, when using credible price trends. Furthermore, incorporating BT's upward revaluation would lead to BT materially over-recovering costs and hence to prices that are higher than necessary to ensure an adequate rate of return.

Ofcom's proposed approach based on the indexation of past capital expenditure could provide a valuation of the duct network broadly in line with past determinations of the RAV. This consistency with past determinations, in particular the 2005 decision on the valuation of the network, is important to ensure certainty for all stakeholders

Any duct valuation should however reflect the actual movements in the replacement cost of duct since the expenditure was made. Changes in costs will be driven by a combination of inflation in inputs and efficiency gains. For example, BT/Ofcom has estimated that there was an 8% nominal reduction in the unit cost of duct in 2009/10 due to efficiency gains resulting from a move to national purchasing. As the rate at which BT makes efficiency gains apparently exceeds the rate at which unit costs of key inputs such as labour increase, the unit cost of duct should decline in real terms over time. This does not appear to have been taken into account in Ofcom's modelling which is based on a construction price index which appears to be a poor proxy for movements in BT's costs.

The CCA estimates produced by BT appear to consistently overstate the actual depreciation of the duct network, compared to the capital expenditure of maintaining the network. It is unclear what accounts for this discrepancy which

may be due to inaccuracies in the network valuation or in the assumed rate of depreciation. To date, the RAV adjustment has resulted in depreciation charges in the model which are more in line with the long run level of capital expenditure. However over time the impact of the RAV adjustment will become smaller, as the assets to which the adjustment is applied become fully depreciated, which could lead to the depreciation charge converging to a level which is too high.

Given that Ofcom is proposing to move away from an access pricing approach based on BT's RFS duct valuation, it seems appropriate to consider at this time a forward looking methodology that allows BT to recover efficiently incurred duct costs while providing regulatory certainty and transparency. One approach which could meet these objectives would be as follows:

1. Set the regulatory asset value (RAV) as at end March 2011, using the methodology set out in the 2005 Copper Statement, implemented using an indexation approach to estimate the post-1997 CCA;
2. Determine the depreciation charge for the price control period based on the best estimate of the level of capital expenditure required for operating capital maintenance (OCM), taking into account any offsetting disposal value of scrapped copper cable;
3. Project forwards the RAV based on capital expenditure, less the determined depreciation charge plus an index based revaluation based on the forecast change in unit costs of the network; and
4. Set the costs to be recovered in the price control as depreciation less holding gains plus a return on capital employed.

It may be reasonable for Ofcom to give greater weight to setting the costs of cable within duct to reflect the competitive level of prices, given the potential for competitors to BT to compete by rolling out their own cable within BT's duct. However this does not necessarily imply that BT's CCA valuation of copper cable is the appropriate basis for setting the charge control.

While Ofcom's analysis has focussed on the valuation of duct, a similar process is used to derive the costs of copper cable. Many of the methodological weaknesses that led to Ofcom rejecting BT's CCA valuation of the duct network also apply to the valuation of copper cable within this duct. The lack of appropriate price information implies that it is not possible to evaluate whether the resulting valuation is credible: these issues may manifest themselves in the future through unexplainable movements in valuation due to changes in BT's methodology or assumptions. Additionally, the very high volatility in copper prices has led to volatility and unpredictability in successive price controls using

the current approach.[1] Given that any potential new entrants are likely to roll out fibre based networks, it is not clear that setting prices based on the spot price of copper cables every three years will lead to a more efficient outcome than a valuation based upon indexation of past expenditure by general inflation.

[1] Given that increases in copper prices should result in a similar absolute change in the acquisition cost of copper cable and the salvage value of cable at the end of its useful life, the impact of changes in copper prices on depreciation charges should be limited. This is because the overall change in value over the asset lifetime should remain broadly constant. This may suggest that the volatility in annual CCA costs due to price movements has been over-stated in the current methodology.

1 Introduction

The valuation of duct and copper is one of the key inputs to the model and one where there is significant scope for Ofcom to exercise its judgement when making a decision on the appropriate methodology. Ofcom's continued application of the regulatory asset value (RAV) adjustment and rejection of the revaluation of duct in the last Regulatory Financial Statements (RFS) is consistent with past decisions and appears to provide an appropriate balance between Ofcom's objectives.

However, the continued implementation of the RAV adjusted methodology, despite the rejection of BT's duct valuation, raises three interlinked questions:

1. How should the base year valuation of the access network asset base be calculated?
2. How should the asset base be projected forwards and annual allowable revenues for the assets forecast in order to set the charge control?
3. How should the asset valuation be determined in subsequent charge controls taking into account the forecast methodology for the current charge control, if BT's RFS are no longer considered an adequate basis for this purpose?

The consultation document addressed the first question in some detail, but our understanding is that the supplied modelling underlying the proposed charge control was not intended to be a definite indication of the proposals to forecast allowable revenues for the purpose of the price control. On the third question, while we understand that Ofcom cannot fetter its discretion, given the long lasting nature of these assets, an indication of the future treatment of the costing of these assets is necessary in order to assess proposals for the current price control.

In this report we conduct an analysis, building on the analysis presented by Ofcom in the consultation, in order to address the three questions set out above.

Our findings support the continued application of the RAV adjustment and Ofcom's exclusion of the BT revaluation. In addition we set out some proposals for projecting forwards this valuation for the purpose of setting the charge control.

The note covers:

- A review of Ofcom's policy objectives and to what extent these are met by its proposals;
- A quantitative assessment of the inputs to the valuation used to set the price control and the results of this valuation; and

- Our proposals for an alternative methodology for calculating the relevant costs for duct and cable in future price controls.

Introduction

2 Review of Ofcom's proposed approach

Duct and copper cable are key inputs to wholesale line rental (WLR) and the metallic path facility (MPF) local loop unbundling service. Ofcom states in its consultation document that duct-related depreciation and cost of capital represents one quarter of MPF/WLR charges.[2] Overall the costs of duct and cable are approximately half of these charges suggesting that the copper cable within these ducts represents a further quarter of the costs. In recent years, the current cost accounting (CCA) valuation and estimated annual charges for these assets in BT's RFS have fluctuated significantly. This largely reflects a combination of volatility in commodity prices (including copper) and changes to the input assumptions used by BT to value its duct network. Given these large fluctuations, and the move to next generation fibre based access technologies, it seems appropriate at this point to re-consider the underlying objectives of regulating wholesale access prices and whether Ofcom's proposals for duct and copper valuation meet these objectives. Further, we understand that BT has argued that the treatment of pre-1997 assets (described in further detail below), is no longer appropriate, implying that the valuation of these assets should be increased to a CCA level.[3]

The rest of this section sets out:

- Ofcom's policy objectives and how these affect the appropriate choice of asset valuation and cost recovery methodology to use in the proposed charge control (Section 2.1);
- A description of Ofcom's proposed approach to cost recovery (Section 2.2); and
- An evaluation of Ofcom's proposals in light of its objectives (Section 2.3).

2.1 Ofcom policy objectives

In the consultation document, Ofcom describes its specific policy objectives in proposing the charge controls for local loop unbundling (LLU) and WLR:

- "To prevent BT from setting excessive charges for LLU and WLR services… while providing incentives for it to increase its efficiency;

2 Paragraph 3.33.

3 Paragraph 3.39 of the current consultation document.

- To ensure that prices are subject to appropriate controls whilst still encouraging BT to maintain service quality and innovation…;
- To promote efficient and sustainable competition in the delivery of LLU and WLR services;
- To provide regulatory certainty for BT and its customers … ;
- To encourage investment and innovation in the relevant markets; and
- To ensure that the delivery of the regulated services is sustainable, in that the prevailing prices provide BT with the opportunity to recover all of its relevant costs (where efficiently incurred), including its cost of capital."[4]

These regulatory objectives can be used to choose the appropriate methodology for valuing assets and determining regulated charges. Any method which sets charges such that investors in BT can expect over time to recover capital expenditure and the opportunity cost of financing the carrying value of the assets, will meet the key objectives of maintaining sustainable investment while preventing excessive prices.

Nevertheless, meeting this requirement of cost recovery still leaves a range of potential solutions for recovering capital expenditure over time. In general, there can be a trade-off between methodologies which attempt to proxy the charges that would prevail in a hypothetical competitive market and those which ensure predictable prices, as competitive level of prices will be affected by factors such as unexpected changes in input prices or technological developments. Regulatory decisions on the appropriate methodology for each set of assets will then need to take account of the weight given to the objectives outlined above and the practical issues in implementing different methodologies. Factors which may affect the choice of methodology may include:

- Whether an asset is determined to be "replicable" or "non-replicable";
- The degree to which parameters such as asset lives, the (efficient) volume of assets in service, unit costs and price trends can be accurately estimated; and
- Whether the assets consist of discrete components or form a single indivisible network.

We discuss each of these in turn below.

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4 Paragraph 2.39

2.1.1 Replicable and non-replicable assets

Whether assets are replicable or non-replicable will inform the relative weighting that should be given to different policy objectives. In particular, where competition for the provision of services is unlikely or would be inefficient, there is less of a need to set regulated charges that reflect those that may prevail in a competitive market. Therefore, ensuring efficiency in the provision of services and providing certainty for BT and its customers become relatively more important. This was a view that Ofcom used in its 2005 statement to support the introduction of the RAV adjustment (see Section 2.2.1).

Assets can be considered to be replicable where competition based on replicating the assets is likely to be efficient. The decision over whether competition is efficient should balance the additional forward looking costs of duplicating the assets compared to the likely benefits brought by increasing competition. In the UK duct may be considered in principle, and to a significant extent in practice, to be non-replicable, unless there was evidence that the relatively high fixed cost of fully duplicating the duct network could be expected to be outweighed by the advantages of introducing network based competition.

2.1.2 Estimation of parameters

Asset valuation and costing methodologies typically require the estimation of a number of parameters. Simpler costing methodologies (such as renewals accounting and historic cost accounting (HCA) approaches) may only require a single parameter to be estimated: the expected economic life of assets lives. Estimates of asset lives can be combined with information on past capital expenditure to estimate the future capital expenditure required to maintain the network.

In contrast, methodologies which attempt to proxy charges that could be expected to prevail in a hypothetical competitive market may require a greater number of input parameters and assumptions. These additional parameters may include:

- The volume of assets actually in service or the volume of assets that a hypothetical efficient operator would require to deliver services;
- The unit replacement cost of assets;
- Past and future trends in the price of assets; and
- Past and expected future demand for services.

For some groups of assets, particularly those with long economic lives, some of these parameters may be highly uncertain. This can lead to a lack of transparency and the risk of subjectivity when deriving charges. In turn, this can lead to an increased risk of material departures from cost recovery either when new

information becomes available or when subjective judgements are revised. Thus, the benefits of methodologies that are based on uncertain parameters and assumptions will need to be balanced against the potential costs due to the introduction of increased uncertainty and the risk of over- or under-recovery of costs.

2.1.3 Valuing divisible and indivisible network components

Applying traditional accounting approaches, which assume that the asset base is made up of a finite number of identifiable assets, may be difficult for some network assets. In particular, where ongoing capital expenditure seeks to maintain the functionality of the existing network, rather than to replace individual components, the concept of a typical asset life may have limited relevance. Infrastructure renewals accounting provides an alternative methodology in these cases by treating the whole network as a single asset. Under this approach, depreciation charges are set to take account of the expenditure required to maintain the operating capacity of the network, rather than on the basis of assumptions about asset lives.

2.2 Ofcom's proposed approach to cost recovery

In the proposed price controls, allowable revenues (regulated charges) are calculated using the annual capital costs of assets plus operating costs. The default is to calculate capital costs based on the valuation of assets on a CCA basis. In the case of duct and copper cable, Ofcom departs from CCA by applying an adjustment to pre-1997 assets so that their valuation is based on indexed historic cost accounting (indexed HCA) rather than CCA. This adjustment is referred to as the RAV adjustment.

2.2.1 The RAV adjustment

The RAV adjustment is designed to account for a change in the regulatory accounting approaches over the lifetime of these assets. This is because changing the accounting approach during the lifetime of an asset can result in the under or over recovery of the costs of that asset. The move from HCA to CCA for regulatory purposes in 1997, combined with the increase in copper and labour prices over time, led to "windfall gains" for BT. These meant there was scope for the over-recovery of costs, as there were significant holding gains from increasing asset prices which would have led to returns above the determined level for these assets. Therefore, in the 2005 Review,[5] Ofcom reverted from

5 "Local loop unbundling: setting the fully unbundled rental charge ceiling and minor amendment to SMP conditions FA6 and FB6", Ofcom statement, 30 November 2005

CCA to an indexed HCA approach for the valuation of BT's access assets purchased prior to 1997. Under this approach, the pre-1997 assets are valued on a net HCA basis as at 2005 and indexed to the retail price index (RPI) from 2005 onwards. Ofcom estimates that if the RAV adjustment were to be removed, this would add an additional £9-10 per year per line for MPF and WLR products.[6]

Assets purchased after 1997 continued to be valued on a CCA basis. This allows for a gradual return to full CCA valuation over time as the pre-1997 assets reach the end of their useful lives.

Implementing the RAV adjustment is not simple, and the methodology used by Ofcom in previous price controls was not fully disclosed nor consulted upon. In this consultation Ofcom have supplied two sets of spreadsheets implementing versions of the RAV adjustment methodology, which we have used for our analysis below[7].

2.2.2 Duct valuation adjustment

To date, Ofcom has used the CCA valuation of assets in BT's RFS as the basis for asset valuation to set the LLU and WLR price control. The RAV adjustment is applied to the CCA valuation.

BT's 2009/10 CCA duct net valuation in the RFS increased by £1.8 billion compared to the equivalent 2008/09 valuation. The largest single reason for this increase is a much lower national build discount (14.5% compared to 45% in 2008/09). This discount is applied to the prices BT actually paid for current expenditure to reflect the hypothetical discount that might be achieved if the network was replaced all at once.

Ofcom has determined that the resulting CCA valuation of post-1997 assets is inconsistent with recorded capital expenditure in this period, given plausible estimates of price trends. Therefore, Ofcom considers that the CCA valuation used in the RFS is not appropriate for determining the charge control. As described in Section 3.2, we support this conclusion. Based on its analysis, Ofcom used an alternative valuation of the duct assets, based on an indexation of recorded capital expenditure. We consider the appropriateness of this valuation in Section 3.2.1.

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6 Paragraph 3.41

7 The version of the model issued with the consultation when initially published appears to have been based on a CCA valuation consistent with BT's regulatory financial statements while the version issued with the re-issued consultation appears to be consistent with Ofcom's view of the opening valuation of duct assets.

2.3 Evaluation of Ofcom's proposals

Since the 2005 Copper Statement a number of new pieces of information have come to light which may mean that the use of a CCA based valuation of the access network may no longer be appropriate to determine the charge control. This information points towards a reduction of the benefits resulting from a CCA based approach, and an increased risk of investors in BT either over-recovering, leading to excessive prices, or under-recovering, damaging investment incentives for BT and competitors. In particular:

- Movements in BT's CCA valuation of duct within the RFS have demonstrated a high level of uncertainty and subjectivity in the valuation;
- The introduction of regulated physical infrastructure access (PIA) appears to indicate that Ofcom considers the duct network to continue to be non-replicable;
- The increased volatility in commodity prices in recent years means that forecasting the price of copper cable is increasingly uncertain; and
- The use of fibre to the premises (FTTP) for new build access networks suggests that copper cable is no longer the modern equivalent asset (MEA) for local access networks.

Ofcom seems to have limited its analysis to two areas:

- Whether the continued application of a RAV adjustment to the CCA valuation of duct is justified (the RAV adjustment for copper falling to zero during the period of the cost forecast); and
- The appropriate CCA valuation of the duct network.

These are considered further below.

2.3.1 RAV adjustment

Ofcom sets out three main reasons for the continued use of the RAV adjustment:

- Using CCA for all BT's assets would only be justified if it was expected that a new operator was considering building a new nationwide access network;
- Given this, Ofcom would prioritise the protection of customers in the near term; and
- Investors should be compensated on the basis under which the investment was made (i.e. based on HCA for pre-1997 assets, and based on CCA for post-1997 assets).

Review of Ofcom's proposed approach

Ofcom took the view that the revaluation of access assets was "stifling rather than promoting competition as it led to LLU and WLR prices being higher than they otherwise would have been."[8] Ofcom considers that the reasoning underlying the RAV adjustment that it set out in 2005 remains sound. However, BT has argued that competition based on WLR, SMPF and MPF has now been established and therefore that the RAV adjustment should no longer be applied. Nevertheless, to the extent that duct and copper are non-replicable assets, it does not seem appropriate to move to setting prices based on "full" CCA. This is because a new operator would not consider building a new nationwide access network given the large sunk costs involved. Further, a new operator would not invest in a copper access network as fibre is now the modern technology. In addition, a change in the valuation approach applied by Ofcom, even if in this case it appeared to be to the advantage of potential entrants, would increase regulatory uncertainty going forwards for investors and thus could deter entry even where viable. This means that a CCA approach has limitations given the need to provide stability of prices for both BT and operators that rely on BT's infrastructure.

2.3.2 Valuation of BT's duct network

The recent revaluation by BT of its duct could lead, under the existing approach for calculating the costs of Openreach's assets, to higher LLU and WLR costs and prices – absent any other changes. Ofcom along with its consultants have analysed the complex methodology used to derive the valuation within the RFS.

This revaluation of the duct network leads to a large holding gain which leads to higher pricing in future price controls, above a level required to allow BT to achieve the regulated return. As outlined above, we consider that such a subjective valuation can create uncertainty for both BT and the operators that rely on BT's network to compete downstream, with no clear benefit in terms of encouraging efficient entry in the access part of the network. Therefore, we support Ofcom's conclusion that the CCA valuation used in BT's RFS is not appropriate for use in determining the proposed charge control (we discuss our evaluation of the RFS duct valuation further in Section 3.2).

8 Paragraph A5.11

3 Implementation of the asset valuation

For the reasons set out in Section 2.2.1, we agree with Ofcom that a valuation which includes the RAV adjustment continues to be appropriate in the proposed charge control. However, as Ofcom's implementation of the valuation in the RAV model is complex, it is not straightforward to assess the appropriateness of the results.[9] Ofcom uses input data and assumptions from a range of sources. However, it is not possible to tell from the model which information comes from which source and how it has been adjusted for use in the model. Given the complexity of the calculations, it has not been possible to identify all potential issues by simple inspection of the model.

In light of this, in order to provide an assessment of the Ofcom/BT RAV approach, we have adopted an approach which seeks to independently replicate the RAV methodology – a "shadow" RAV model. Our methodology provides an alternative transparent valuation against which the Ofcom/BT methodology can be compared. We have used data on historic capital expenditure (as provided within the RAV model) to produce direct estimates for each vintage of assets. Comparing the results of this shadow model with the results of the Ofcom model should enable the identification of any material issues with the Ofcom model.[10]

Our review has focussed on three areas.

- First, we have reviewed the input data in terms of the overall valuation of the duct network, on a CCA basis against our estimates of these valuations.
- Second, we have compared Ofcom's estimate of the component of this valuation which it used to construct the RAV adjusted valuation (post-1997 CCA) with our estimates.
- Finally, we compared the results of the resulting RAV adjusted valuation against external benchmarks: the implied valuation based on the costs recovered by BT to date; and a comparison of depreciation charges against capital expenditure.

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9 Ofcom's model is based on a model and data supplied by BT. For ease of reference, we refer to this as Ofcom's approach.

10 We have not sought to directly assess whether there are mechanical mistakes within the model. However, if there were any material mistakes we would expect that these would result in errors in the model outputs. Small differences may not be a cause for concern as using different methodologies will generate different results even if both approaches are "fit for purpose".

Our methodology and underlying data and assumptions are described in further detail in Annex 1 of this report. The results of our review suggest that the part of the model that estimates indexed HCA asset valuation and depreciation for duct assets purchased prior to August 1997 produces results that appear reasonable. These results are presented in Annex 2 of this report.

3.1 BT's overall CCA valuation

The CCA valuation used in the first version of the RAV model appears to be drawn from the system also used to prepare the RFS.[11] Based on our analysis set out below, we find that BT's CCA valuation of its total duct base over time is significantly above the level consistent with past capital expenditure, since movements in the RFS valuation are inconsistent with our results. We also consider BT's valuation of post-1997 assets separately in Section 3.2.

We combine information on past capital expenditure with a range of price trends (as set out in **Table 1** below) to produce direct estimates of CCA valuations and depreciation for each vintage of asset.

11 RAV for Publish.xlsx. We understand that this version of the model contains BT's CCA valuations as used in the RFS. This version of the model was later replaced by "RAV for publish 3.xlsx". We understand that the new version of the model contains Ofcom's own asset valuations in favour of BT's valuations. We consider Ofcom's valuations further in Section 3.2.1.

Table 1. Price trends

Price trend	Description
Price trend 1	Before 1996/97: RPI – 2% to reflect labour inflation and possible efficiency savings over time 1996/97 onwards – implied price trend from the Ofcom model*
Price trend 2	Before 1996/97: RPI – 2% 1996/97 onwards – implied price trend from the Ofcom model* Except for 2009/10 where prices fall by 8% to reflect the reduction in unit price[12]
Price trend 3	RPI – 2%, where RPI is assumed to be 2.5% from 2011/12 onwards

Historic RPI is based on data from the Office of National Statistics combining information. Forecast RPI is assumed to be 2.5% pa consistently with the Ofcom model.[13]

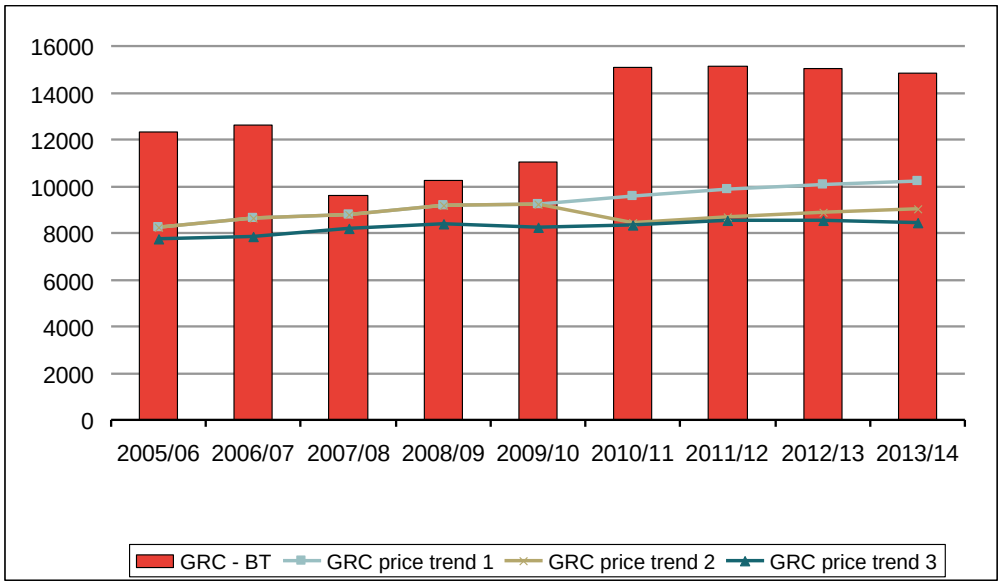
* The implied price trend was taken from the Duct_CCA_Piper sheet of the new version of the Ofcom model. The Ofcom model assumes that prices increase in line with inflation which is assumed to be 3.% p.a. from 2011/12 to 2013/14, and 2.5% from 2014/15 onwards

The figures below compare the gross replacement cost (GRC) and net replacement cost (NRC) of BT's total duct asset base (in other words, both pre and post-1997 assets, shown in bars) against our direct estimates of GRC and NRC. It can be seen that both the level and trend of BT's estimates of GRC and NRC are inconsistent with our direct estimates of GRC. BT's estimates show two unexplained movements: a reduction in GRC and NRC between 2006/07 and 2007/08; and the increase in duct valuation between 2009/10 and 2010/11. These movements do not appear to be consistent with changes in costs as implied within the RAV model and the price trends used in our analysis (see Annex 1 for more detail). This suggests that the movements in valuation were driven by methodological changes, for example revisions in the total volume of assets, rather than price changes.

12 This nominal reduction was the result of moving to national purchasing of civil engineering (see paragraph A.593 of the consultation document).

13 We have used the CHAW and CZBH indices as at March of each year. Data is available from June 1948 onwards and these indices relate to all items. This provides the same index used in the Ofcom model.

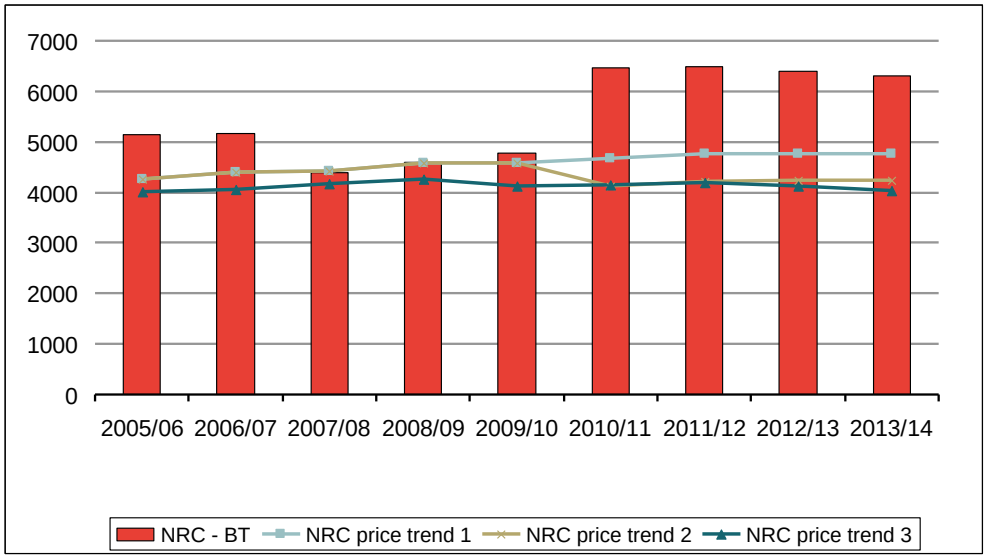
Figure 1. Comparison of BT's gross valuation of pre and post-1997 ducts assets (£million)



Overall, the BT's estimates show generally higher GRC for duct than we would expect given the price trends implied in the model (price trend 1) and both our estimates of duct price inflation (price trend 2 and price trend 3). This suggests that the RFS potentially overestimates the value of these assets. The pattern in the gross valuation is repeated in the net valuation, as shown in **Figure 2**.

Implementation of the asset valuation

Figure 2. Comparison of BT's net valuation of pre and post-1997 ducts assets (£million)



3.2 BT's CCA valuation of post-1997 duct

The RAV adjusted valuation consists of two components:

- The valuation of assets purchased prior to August 1997 on an indexed HCA basis; and
- The valuation of assets purchased after August 1997 on a CCA basis.

The rest of this sub-section considers BT's and Ofcom's estimates of the CCA element.

In the RAV model, post-1997 assets are valued on a CCA basis by taking capital expenditure on these assets and applying a price index based on the overall duct valuation. The methodology used to combine these inputs is not documented, but appears to be based on the "short cut" methodologies documented in BT's Detailed Valuation Methodology.

In our analysis we calculate CCA estimates for post-1997 assets directly by combining the HCA valuations for each year with the implied price change since the asset was purchased, based on the price index.

The figures below compare the GRC and NRC for post-1997 duct assets from the first version of the RAV model (which we understand to be the unadjusted BT CCA valuation, shown in columns) against our estimates of GRC and NRC

based on the price trend implied in the RAV model (price trend 1) and our own estimates of duct price inflation (price trend 2 and price trend 3).

It can be seen that until 2009/10, the valuation of duct under each of the price trend assumption is very similar. However, after 2010/2011 there is a large increase in BT's estimate of GRC and NRC which is not explained by the capital expenditure or a reasonable view of price movements.

Figure 3. GRC for post-1997 assets - duct (£million)

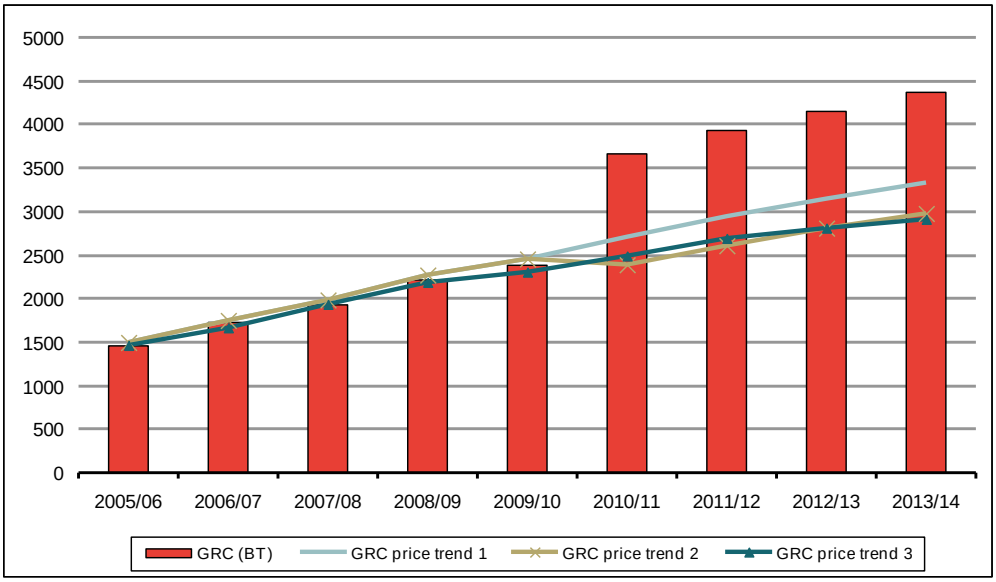
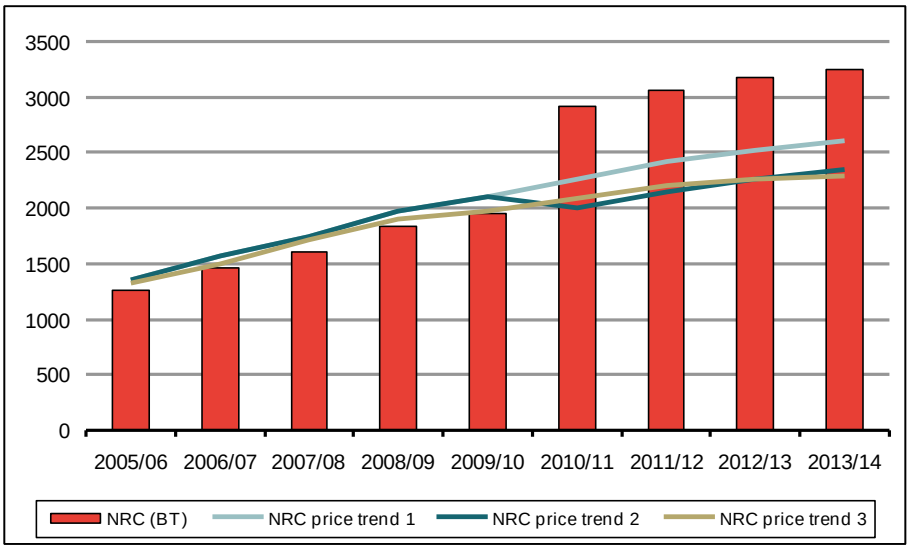


Figure 4. NRC for post-1997 assets - duct (£million)



This very large movement led to an adjustment to the 2010/11 asset valuation in the model used by Ofcom to estimate the price control. Given the problems of BT's approach, Ofcom is proposing to use an indexation approach using the General Construction Services Index (GCSI) for the charge control. We understand the revised version of the RAV model (RAV for publish 3.slx) attempts to proxy this result.

3.2.1 Ofcom's CCA valuation of post-1997 duct

The RAV model used to determine the charge control[14] includes a "correction" for the inconsistency between the implied price movements from the RFS for duct for 2009/10 and external price indices. In this section, we consider the results of this approach against our own direct estimates of costs as outlined above. We find that once Ofcom has applied its adjustment to the valuation of post-1997 duct, the results are more consistent with our results based on similar price indices.

Figure 5 compares the Ofcom's estimates of duct GRC (in columns) with our estimates of duct GRC using the price trend implied within the model (price trend 1) and our alternative price trends (price trend 2 and price trend 3). It can be seen that Ofcom's estimates of GRC are largely consistent with our estimates

14 RAV for publish 3.xlsx

of GRC under price trend 1 but are higher than our estimates under price trends 2 and 3, particularly in later years. This suggests that Ofcom's estimates may overstate the CCA value of duct assets, compared with price indices that take account of efficiency gains over time.

Figure 5. Ofcom estimates of duct GRC (£million)

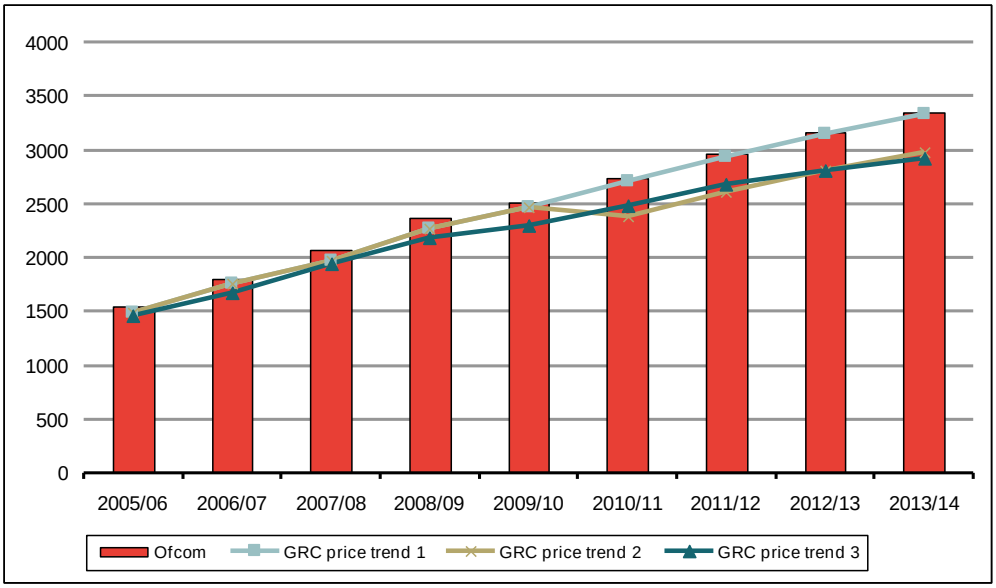
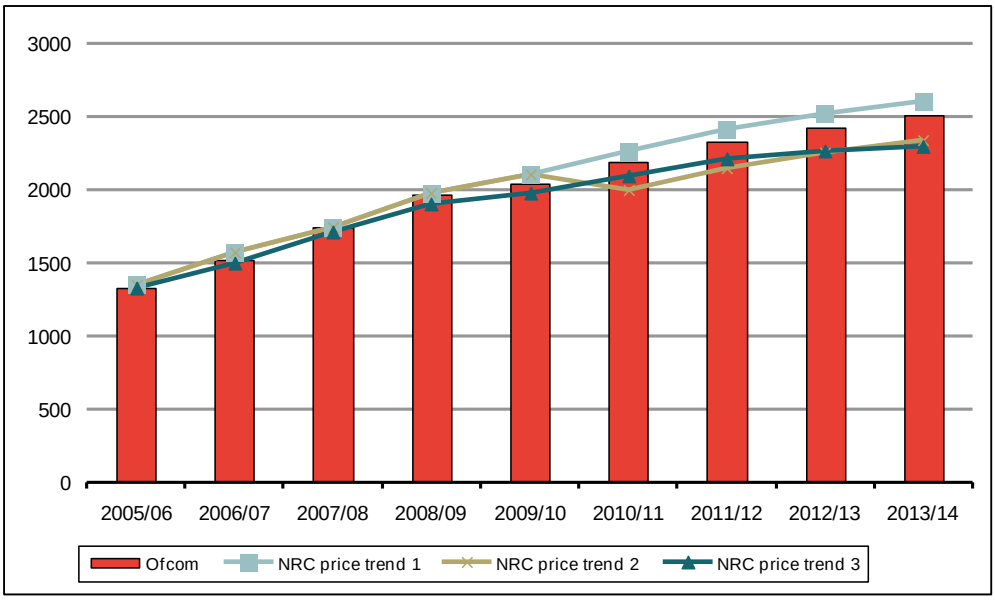


Figure 6 compares the RAV model estimates of duct NRC (in columns) with our estimates of duct NRC using different price trends. Again, the two valuations are largely consistent, although the evidence suggests that Ofcom's estimates may overstate the CCA value of BT's duct network by not taking full account of efficiency gains.

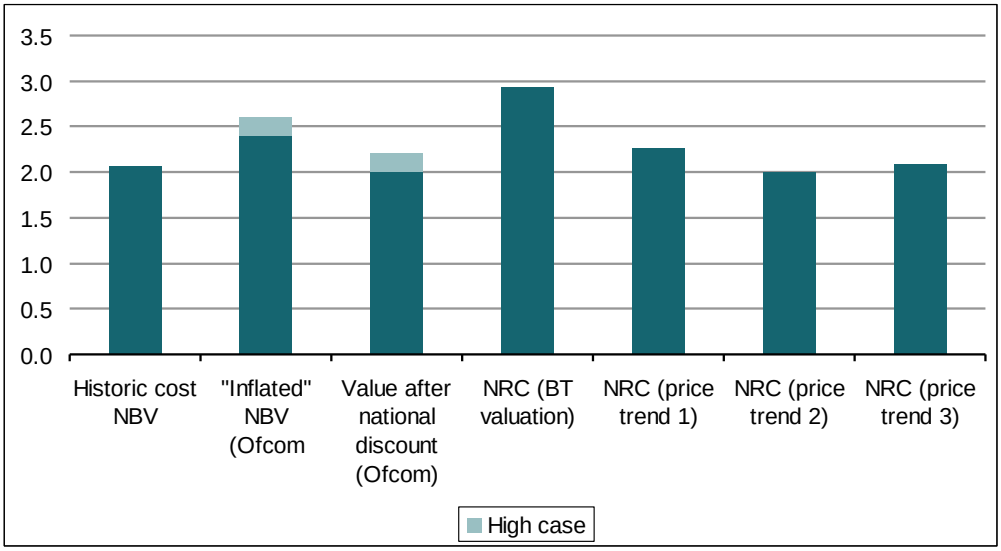
Figure 6. Ofcom estimates of duct NRC (£million)



3.2.2 Summary

The figure below compares the opening net value of post-1997 duct under different valuation methodologies for 2010/11 It can be seen that BT's net valuation of duct on a CCA basis is significantly higher than alternative CCA valuations by both Ofcom and Frontier.

Figure 7. Replacement costs of post-1997 duct



Source: Ofcom and Frontier Economics
The first four columns replicate Figure A5.6 from Ofcom's consultation document.

The results show that the BT valuation appears inconsistent with capital expenditure in the period. The estimates calculated by Frontier taking account of the impact of efficiency gains (price trends 2 and 3) are at the lower end of the valuation range suggested by Ofcom[15].

3.3 Analysis of the overall results of the RAV model

As noted above, one of the primary objectives of the asset costing approach should be cost orientation to ensure investors in BT can reasonably expect to recover efficient incurred costs, while controlling returns to the determined level. In this section we consider the results of the RAV model in terms of whether they are consistent with cost recovery in two aspects:

- Whether the current valuation is consistent with a combination of the valuation as determined in 2005 and the cost recovery determined since then; and

15 It should be noted that for our estimates we have not applied a further reduction to the valuations to take account of the 'national discount' that BT and Ofcom assumes that BT could achieve if it were to replace the network in totality. Application of such a discount to our estimates would reduce our valuations by the assumed percentage discount.

- Whether the estimated depreciation charges are consistent with BT's expenditure on maintaining the duct network.

3.3.1 Consistency with cost recovery

Regulatory asset valuations and allowable revenues from those assets as determined by regulators are closely linked. Ofcom's approach to setting price controls has been to forecast asset valuations from a base year. This valuation is used to determine allowable revenues. Allowable revenues are calculated as:

- The change in value of the assets in service (depreciation less holding gains); plus
- A return on capital employed (calculated as the product of mean asset value and the determined cost of capital).

For the proposed price control, the base year valuation has been estimated independently of the previously forecast valuation underlying the current price control. For example, the valuation of copper cable has been based on current prices of cable rather than the assumptions on price movements underlying the previous price control. This means that the valuation can be the most 'accurate current estimate possible' of the net replacement cost of the asset, if this is assumed to bring benefits.

In other regulated industries such as water, the opening valuation for successive price controls is set to ensure consistency with cost recovery over time. This is done by "rolling forwards" the value of assets from the opening valuation for the previous price control period taking account of capital expenditure[16] less determined depreciation charges plus determined holding gains.

Under the Ofcom approach, there will be over or under-recovery of costs if the base year valuation differs from the forecast used to set the previous price control. [17] This may happen, for example, due to changes in methodology. In contrast, a "rolled forward" approach ensures that regulatory valuations are consistent with determined allowable revenues. This ensures that returns over the lifetime of an asset closely match the determined level.

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16 The capital expenditure included may be previously forecast capital expenditure or actual capital expenditure or some combination of the two depending on the incentive framework.

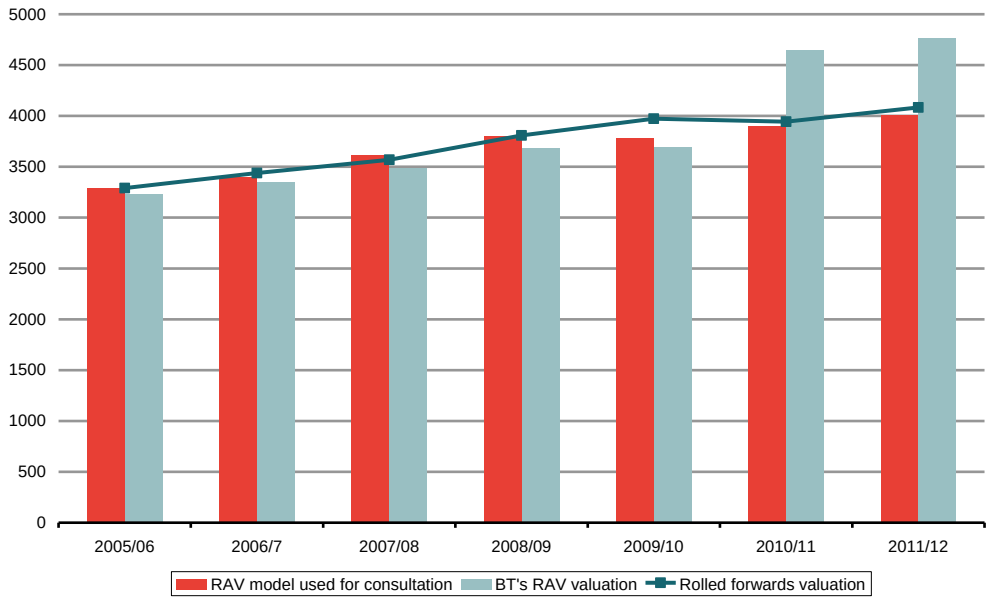
17 This can be seen by considering a discounted cash flow analysis of allowable revenues and the final valuation for the previous price control period. The previous price control is set such that the discounted value of the determined allowable revenues, capital expenditure and the projected valuation at the end of the period is equal to the starting regulated asset value. If the regulatory asset value is reset at the end of the period to be different from the projected value then the discounted value of determined allowable revenues, capital expenditure and the net valuation at the end of the period will differ from the starting regulated asset value.

Figure 8 illustrates the degree to which the revaluation of assets at the beginning of each price control period (independently of valuations from previous price control periods) could result in over- or under-recovery of costs. We compare Ofcom's and BT's RAV valuation in each year, based on the independent CCA valuations, to a RAV rolled forwards from 2005 consistent with exact cost recovery. This is calculated by rolling forwards the 2005 valuation from the current RAV model, with estimates of the depreciation charges and holding gains that would have been projected in 2005, and those underlying the LLU and WLR price controls set in 2009.[18]

This shows that the March 2011 valuation proposed in the consultation is close to the 2005 valuation rolled forwards. This means that the valuation is broadly consistent with cost recovery. However, the valuation in the version of the RAV model initially distributed, based on the BT's estimate of the value of its duct network, is far higher than the rolled forwards valuation. This indicates that setting the charge control by projecting from this valuation could be expected to lead to a significant over-recovery of costs by BT.

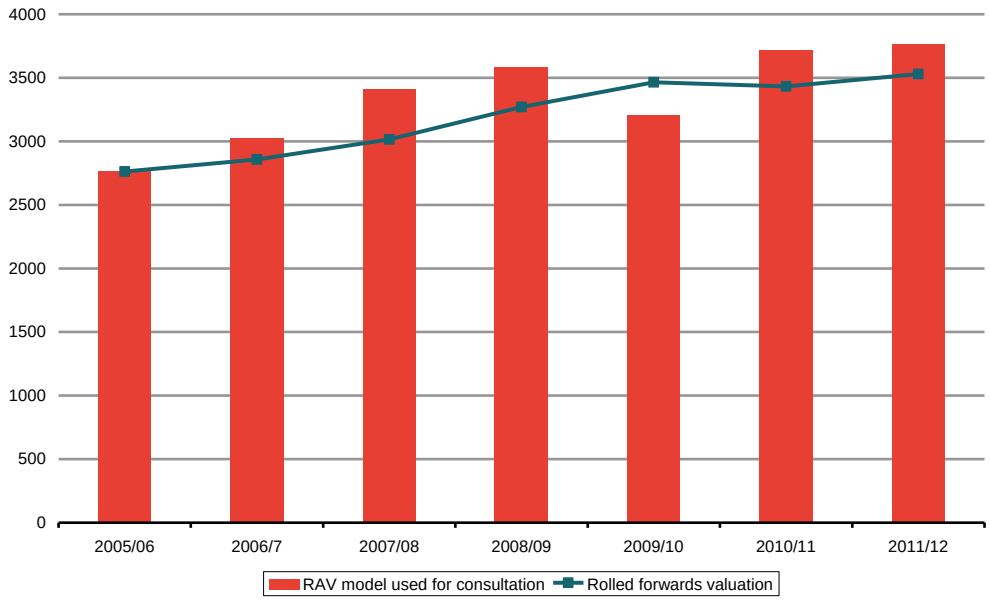
[18] We have estimated the projected depreciation charges and holding gains and losses by projecting forwards valuations from 2005, and form 2009 when the price control was reset, based on an assumption the asset prices would increase by RPI.

Figure 8. RAV model and rolled forwards valuation for duct assets(£million)



For copper cable, the unpredictable volatility of copper metal prices, means that the RAV model valuation differs from that required to ensure cost recovery. This is because the RAV model valuation is generally higher due to the significant increases in copper prices in recent years. The higher March 2011 valuation in the RAV model compared to the rolled forward estimate indicates that BT will over-recover costs if this valuation is used as the basis for the next price control.

Figure 9.: RAV and rolled forwards valuation for copper assets (£million)



3.3.2 Analysis of duct depreciation charges

The duct network should be broadly in a steady state as the scope of the network will not have significantly changed in the last two decades. Further, the recent gradual reduction in copper pairs is likely to have little impact on the costs of the duct network as most costs are driven by the length of the duct network, which is unaffected by 'thinning' of the cable network, rather than the capacity of the duct in terms of cross sectional area.

The depreciation charge should reflect the rate at which the network is degrading. In a steady state, we would expect the CCA depreciation charge and the average level of capital expenditure to be at a similar level in order to ensure the operating capacity of the network is maintained.

Comparing the CCA depreciation charges within the RAV model to the capital expenditure in the model, we can see that the depreciation charges are consistently significantly above the capital expenditure for duct.

Figure 10. Duct capital expenditure and depreciation (£million)

Source: RAV model

There are a number of reasons why capital expenditure may have been consistently lower than CCA depreciation in the recent past. These may include some combination of the following:

- The gross replacement cost of the duct network has been consistently overstated which has led to inflated CCA depreciation charges;
- The asset life for duct is on average significantly longer than assumed in the CCA depreciation calculations;
- Capital expenditure has been at a lower level than that required to maintain the network; or
- Capital expenditure has been lower in the last decade due to the asset base being relatively new, but will increase as the asset base ages.

While the level of capital expenditure has shown some volatility over time, this in itself does not appear to be sufficient to explain the difference between the recent depreciation and capital expenditure. Neither does there appear to be any evidence that the quality of the duct network is being degraded due to under-investment as there is no evidence of, for example, increased fault rates. Thus there appears to be little reason to believe the current level of capital expenditure is below the long term level required to maintain the operating capacity of the network.

Given the other issues identified in the RFS based CCA estimates for duct, the hypothesis that the depreciation charge is higher than the level of expenditure required for operating capital maintenance appears the most likely reason. This may reflect a fundamental difficulty in applying standard accounting methodologies to an infrastructure asset.

The RAV adjusted depreciation charges to date have been in line with the level of capital expenditure, but will converge to the CCA level over time, and as such would be expected to overstate the true level of depreciation over time.

If the level of depreciation included within the charge control was systematically over-estimated in the future then this will lead to the level of charges being set above costs, bringing forwards the recovery of costs.[19] Ofcom should therefore investigate the reasons for the apparent over-estimation of depreciation. If necessary, Ofcom should make adjustments to bring depreciation charges into line with the expected long run level of capital expenditure required to maintain the network. One approach would be to adopt an infrastructure renewals accounting approach, where the depreciation charge is set directly to reflect the long run level of capital expenditure required to maintain the network.

3.4 Conclusion

The underlying rationale for implementing the RAV adjusted methodology still appears to be valid and the results used in previous price controls appear reasonable. However continuing to use the implementation used in the previous price control, based on BT's CCA estimates which do not appear to be estimated on a consistent basis, introduces uncertainty and the risk of over- or under-recovery of costs. Given the primary objective of the methodology is to ensure cost recovery, this suggests that the previous methodology should be re-considered.

While Ofcom's proposed adjustments appear to better meet the intent of the methodology set out in the 2005 Copper Statement, the application of *ad hoc* adjustments introduces another layer of uncertainty and subjectivity. Thus there is a need to develop a robust and predictable methodology to be used in this and future charge controls. This is considered next.

[19] As there is an offsetting decrease in valuation this will in the long run not affect the level of recovery of costs, but only the timing of that recovery.

4 Proposed approach

The existing valuation approach, based on BT's estimates does not meet Ofcom's objectives in terms of cost orientation, transparency and predictability. However in broad terms the overall framework appears broadly sound. Therefore, the main issue is how to populate the framework in terms of the underlying parameters. In particular:

- The opening RAV;
- The projected depreciation charges for the price control period; and
- The asset revaluation during the price control period.

4.1 Opening RAV

4.1.1 Duct

Ofcom has demonstrated, and our analysis in this report has reinforced, that BT's CCA estimates do not provide a reasonable basis for the opening regulatory asset value for duct assets.

Ofcom's analysis suggest, and our analysis supports, an opening valuation based on a combination of

- Indexation of capital expenditure between August 1997 and the opening valuation to provide CCA valuations;
- HCA values for assets purchased before August 1997, indexed by RPI since 2005 as in the current RAV model.

The choice of index to use for the CCA valuation should take account of the significant efficiency gains demonstrated by BT, for example the 8% reduction in nominal unit costs in 2009/10, rather than being based on an unrelated construction price index as suggested by Ofcom.

4.1.2 Copper cable

Given the lack of alternative price information it may be reasonable to accept the BT's RFS based estimates as the CCA input for the opening asset value, with the RAV adjustment applied.

4.2 Depreciation charges

4.2.1 Duct

BT's and Ofcom's estimates of CCA based depreciation charges appear to over-state the actual depreciation of the network. An approach based on an estimate of the long run level of capital expenditure required to maintain the network may be more appropriate. This could be estimated as the average annual level of capital expenditure over the recent past, expressed at current prices.

4.2.2 Copper cable

The RFS-CCA based depreciation charges appear to be broadly in line with the level of capital expenditure required to maintain operating capital. However the depreciation charge should be adjusted downwards to reflect the scrap value of copper cable that is removed from the network.

4.3 Revaluation approach

4.3.1 Duct

The current cost forecast model makes implicit assumptions about the expected movement in capital expenditure driven by a combination of changes in service volumes, input unit cost changes and net efficiency gains. The proposed assumptions for the latter two elements could be combined to derive the price index which could be used to revalue the duct network on a forward looking basis.

4.3.2 Copper cable

The future trend in copper commodity prices and hence in copper cable unit costs, is subject to a high degree of uncertainty. A neutral approach, based on indexation by RPI, may provide a transparent and predictable outcome.

4.4 Successive price controls

Given that Ofcom proposes to break the link with the RFS, at least for duct assets, a question arises as to how to set the opening valuations for successive price control. Some guidance from Ofcom would provide increase predictability for future investment decisions.

Proposed approach

Annexe 1: Direct approach for asset valuation

This annex sets out the methodology and input data that Frontier used to derive the costs used in the comparisons in this note.

Capital expenditure

We use historic capital expenditure from the RAV model as an input to our benchmark calculations.

Table 2. Capex data sources

Data	Sheet	Workbook
Duct historic capex – pre 1997/98	Duct_HCA_Depreciation	RAV for publish 3.xlsx
Duct historic capex - 1997/98 onwards	Duct_HCA	RAV for publish 3.xlsx
Copper historic capex – pre 1997/98	Copper_HCA_Depreciation	RAV for publish 3.xlsx
Copper historic capex - 1997/98 onwards	Copper_HCA	RAV for publish 3.xlsx

Asset lifetimes

We use constant asset lifetimes based on those set out by Ofcom in its 2005 statement. The assumed asset life for duct is 40 years; and 18 years for copper. [20]

Price indices

We use a range of price trends in the model to re-value assets on a CCA basis. These are set out in **Table 3**.

20 "Valuing copper access statement", Ofcom August 2005

Table 3. Price trends

Price trend	Description
Price trend 1	Before 1996/97: RPI – 2% to reflect labour inflation and possible efficiency savings over time 1996/97 onwards – implied price trend from the Ofcom model*
Price trend 2	Before 1996/97: RPI – 2% 1996/97 onwards – implied price trend from the Ofcom model* Except for 2009/10 where prices fall by 8% to reflect the reduction in unit price[21]
Price trend 3	RPI – 2%, where RPI is assumed to be 2.5% from 2011/12 onwards

* The implied price trend was taken from the Duct_CCA_Piper sheet of the new version of the Ofcom model. The Ofcom model assumes that prices increase in line with inflation which is assumed to be 3.% p.a. from 2011/12 to 2013/14, and 2.5% from 2014/15 onwards

** Historic RPI is based on data from the Office of National Statistics combining information. Forecast RPI is assumed to be 2.5% pa consistently with the Ofcom model.[22]

Calculation steps

The figure below summarises the calculation steps in our direct approach. We start with information on historic capital expenditure. We use asset live information to determine the percentage of the asset value that is depreciated in each year and the percentage of the asset value that remains in each year for each asset vintage. This is used to calculate the value of depreciation in each year and the closing net book value of assets.

We use information on price trends to calculate the CCA depreciation and NRC in each year for each vintage of asset.

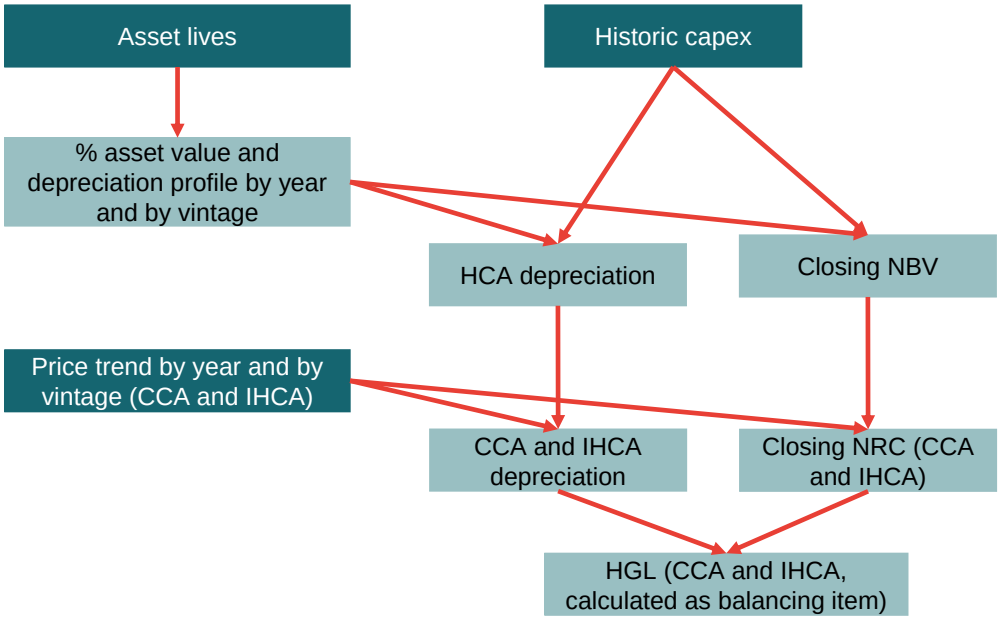
Holding gains and losses are calculated as a balancing item (in other words, as the difference between the NRC between years plus CCA depreciation plus additions in the year.

21 This nominal reduction was the result of moving to national purchasing of civil engineering (see paragraph A.593 of the consultation document).

22 We have used the CHAW and CZBH indices as at March of each year. Data is available from June 1948 onwards and these indices relate to all items. This provides the same index used in the Ofcom model.

Annexe 1: Direct approach for asset valuation

Figure 11. Overview of direct approach



Source: Frontier Economics

Annexe 2: HCA valuations in the RAV model

Overall HCA estimates

Based on the analysis set out below, we find that, despite the slight difference in approach in implementing asset lives, the Ofcom model results are close to the results of our model. This provides re-assurance that the HCA outputs are robust.

HCA in year depreciation for the total duct asset base is hardcoded within the RAV model until 2007/08. From 2008/09 onwards depreciation is calculated within the model based on past and forecast capital expenditure and asset lives.[23]

The model takes account of the changes in assumed asset lives in statutory and regulatory accounts rather than assuming a constant asset life. We understand that Ofcom has used this approach in its previous charge controls. However, it is not clear that the approach of using changing asset lives is consistent with the 2005 Copper Statement which sets out the revised asset lives to be used when setting prices for the access network.

In order to review the HCA valuation in the RAV model, we assume that information on historic capital expenditure is robust since it is used in the statutory accounting systems and is therefore subject to independent audit.[24] We have then calculated the asset valuation based on a constant 40 year asset life, which we believe to be more appropriate than using changing asset lives.

Figure 12 compares the HCA valuations for all (pre and post-1997) duct assets as shown in the Ofcom model (GBV and NBV in columns) against our own estimates (shown in lines). It can be seen that our estimates are largely in line with Ofcom's estimates, particularly in later years. In early years, our estimates of NBV and GBV are slightly lower than Ofcom's estimates. We would expect this difference to be explained by different approaches to asset lives as there is no other information either within the model or the consultation document to suggest that there are other differences in methodology.

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23 In the Duct_HCA sheet and Duct_HCA_Depreciation sheets respectively.

24 The information on duct capital expenditure was taken from the Duct_HCA_Depreciation sheet from 1937/38 – 1966/97; and from the Duct_HCA sheet for 1997/98 onwards.

Figure 12. HCA GBV and NBV estimates for all duct assets (£million)

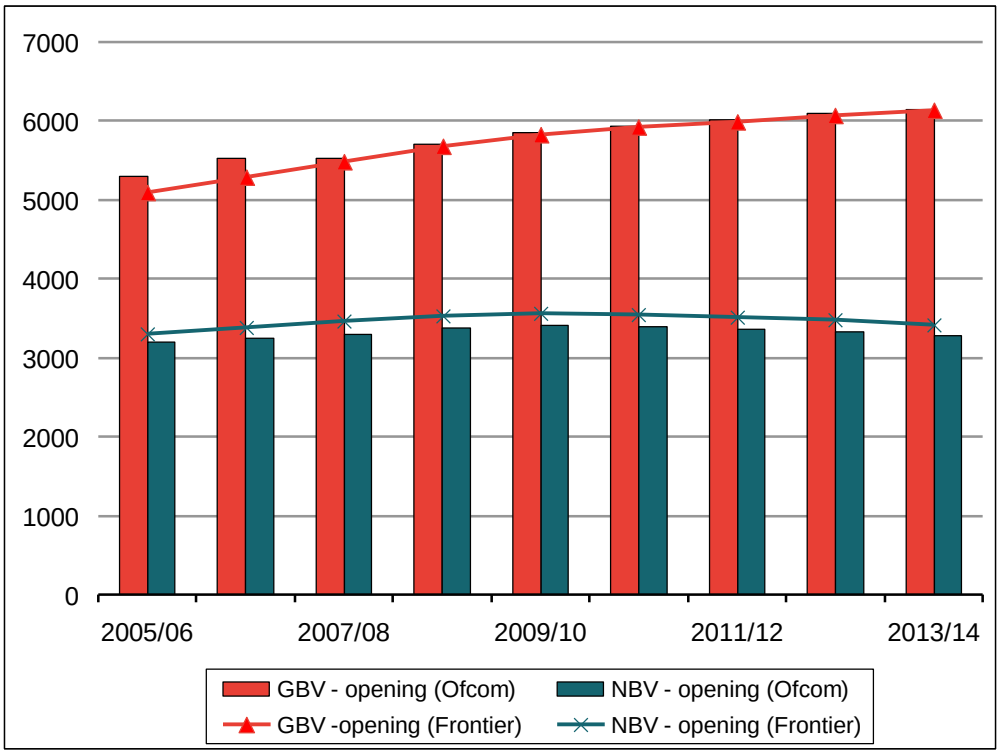
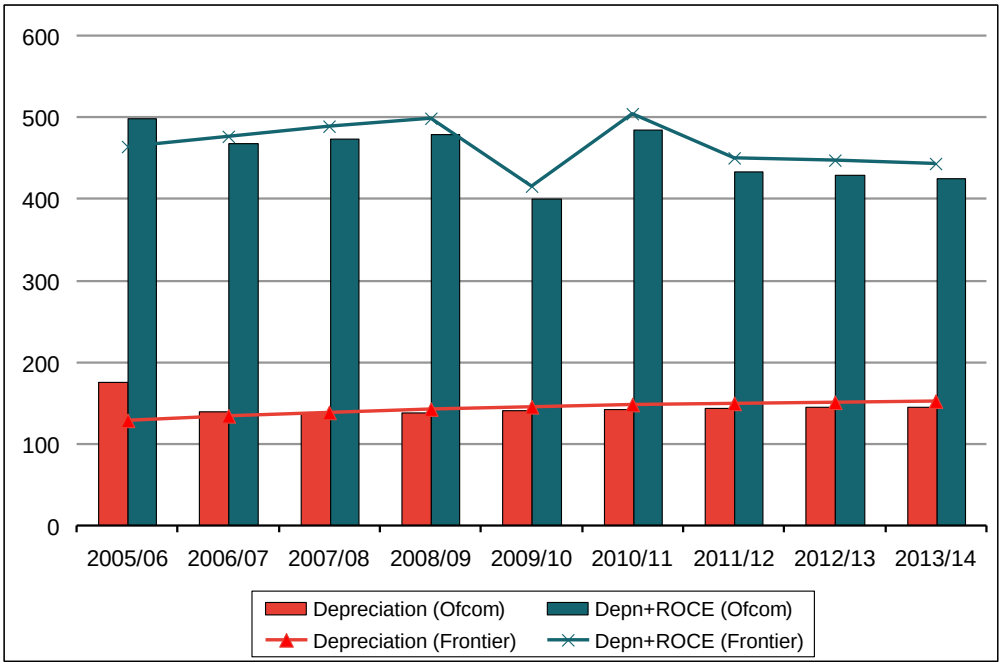


Figure 13 compares the HCA depreciation and return on capital employed (ROCE) for the total duct asset base as shown in the Ofcom model (in bars) and our results (in lines). In 2005/06, we estimate that depreciation is lower than Ofcom estimates. Again, given that there is no other information to suggest otherwise, we consider that this is due to the different treatment of asset lives. In particular, the Ofcom depreciation calculations include assets that we would consider to be fully depreciated. In later years, Ofcom's calculations are more in line with our calculations.

Annexe 2: HCA valuations in the RAV model

Figure 13. HCA depreciation and ROCE for all duct assets (£million)



Pre-1997 HCA valuation

The RAV adjusted valuation consists of two components:

- The valuation of assets purchased prior to August 1997 on an indexed HCA basis; and
- The valuation of assets purchased after August 1997 on a CCA basis.

Both the Ofcom model and the Frontier model allow the HCA valuation related to pre-1997 assets to be separately identified. **Figure 14** and **Figure 15** compare Ofcom's HCA estimates for these assets (in columns) against our own estimates and shows that are largely in line. The disaggregation of HCA results into per- and post-1997 results does not appear to have resulted in any artefacts due to the changing asset life assumptions used in Ofcom's model.

Figure 14. HCA GBV and NBV of pre-1997 assets - duct (£million)

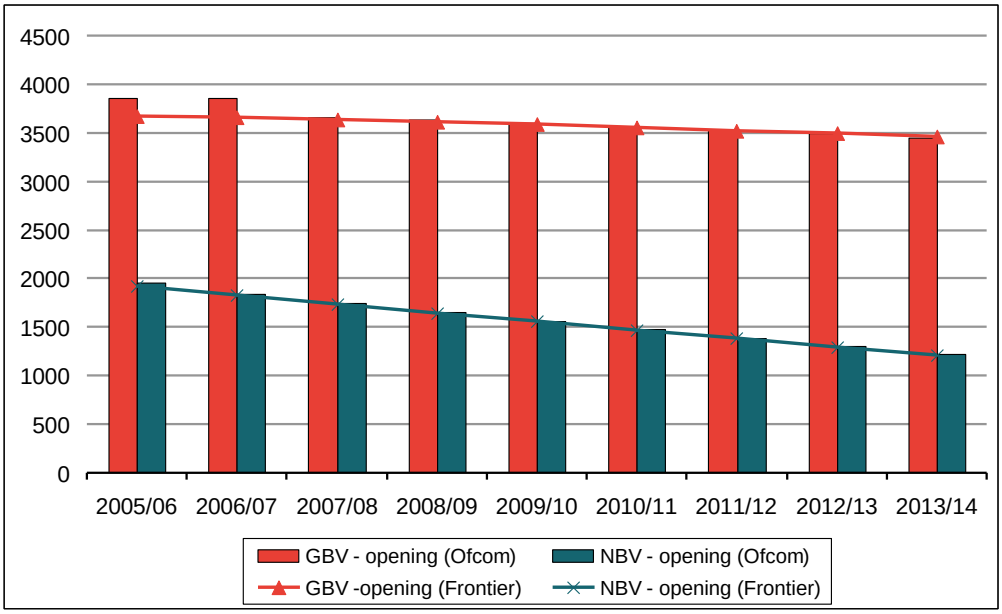
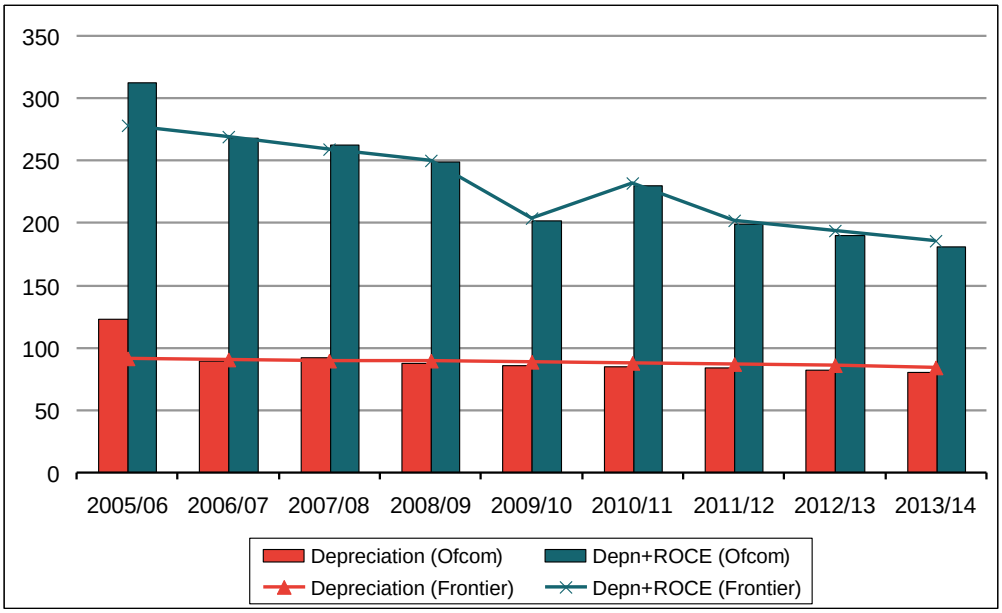


Figure 15. HCA depreciation and ROCE of pre-1997 assets - duct (£million)



Annexe 2: HCA valuations in the RAV model

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