BT Access Network Investment

A REPORT PREPARED FOR SKY

June 2015

BT Access Network Investment

Executive Summary **1**

1 Recent trends in BT investment **3**

1.1 BT significantly reduced capital expenditure from 2009. ..... *3*

1.2 BT's NGA Roll out *6*

1.3 Summary *8*

2 BT's investment in access networks **9**

2.1 Openreach and access networks *9*

3 Impact of reduction in access network investment **17**

3.1 Linkage between investment and quality of service *17*

3.2 Impact of reduced quality of service *17*

4 Conclusions **21**

4.1 Efficiency of reduced investment *21*

4.2 Profit maximisation *22*

4.3 Conclusion *23*

Contents

BT Access Network Investment

Figure 1. BT dividends 4
Figure 2. BT Group capital expenditure 5
Figure 3. BT capital expenditure by division 6
Figure 4. Openreach capital expenditure 10
Figure 5. BT "access" capital expenditure 11
Figure 6. Duct and copper capital expenditure 12
Figure 7. Net book value of copper cable and duct 13
Figure 8. Comparison of capital expenditure and operational capital maintenance 14
Figure 9. Openreach fault levels 18
Figure 10. Trend in copper faults 19
Figure 11. WLR fault repair performance 20

Executive Summary

In 2008/09, BT significantly reduced the level of capital expenditure across all its divisions, apparently at least partly in response to underperformance at BT Global Services. Group-wide capital expenditure fell by approximately 25% between 2007/08 and 2009/10 and has remained broadly flat since.

Over the same period, BT, via its access services division (Openreach), significantly increased capital spend on its next generation access (NGA) roll out, aiming to reach two thirds of households in the period between January 2010 and 2015. BT initially forecast that the investment required to roll out the NGA network was £2.5 billion (broadly equivalent to one year's capital expenditure at a group level).

The combination of reduced capital expenditure overall and an increase in expenditure on NGA has resulted in capital expenditure on the existing copper access network and underlying shared infrastructure (i.e. ducts and poles) falling significantly.

This reduced capital expenditure on the copper network and underlying infrastructure means that levels of capital expenditure have been considerably below BT's own estimate of the level required to maintain the network in a steady state (known as operational capital maintenance). As a result, the quality of the copper network and the underlying infrastructure appears to have degraded over the last five years, leading to increased fault rates. The additional faults will have increased the workload on Openreach's engineers to fix these faults and as the overall size of the Openreach workforce has been falling over time despite the NGA roll out, this increase in workload reduced the resources available for other tasks resulting in longer repair and provisioning times.

The reduction in capital expenditure on the copper access network appears to have been driven by short termism, with management targeting short term measures of cash flow rather than longer term profitability: *"We're clearly focused on cash. That's the most important number for us."*[1]

Given the relatively long payback period[2] on investments in the access network, with asset lives of up to 40 years, a focus on short term cash generation could have led to profitable investments in the regulated access network being foregone as they would not generate positive cumulative cash flow for a number of years.

---

1 Gavin Patterson, Chief Executive. BT Group Plc Q4 2013/14 Results Presentation Transcript 8 May 2014

2 The length of time in which the cash value of investments will be recouped through higher revenues or reduced operational expenditure.

The increased weight given by BT management to maximising short term cash flow rather than long term profitability may mean price regulation of services delivered over the copper access network, based on the assumption that management will be profit maximising, may not have been effective. This could have resulted in customers receiving a lower quality of service, or in the long run paying higher prices, than is efficient.

1 Recent trends in BT investment

In this section, we outline the context in which BT has made recent decisions on capital expenditure, including on the access network. We first consider the broad financial context in which BT has made decisions, followed by an explanation of developments in the access network.

1.1 BT significantly reduced capital expenditure from 2009

In May 2009, BT announced approximately £2 billion of charges associated with its Global Services division[3] reflecting reduced expectations of the future profitability of contracts.[4] The impact of the reduced expectations of profitability, and hence cash flow, along with other factors such as the need to make increased pension deficit repair payments, led to BT sharply reducing its dividend, as shown in **Figure 1** and refocussing financial management on cash flow:

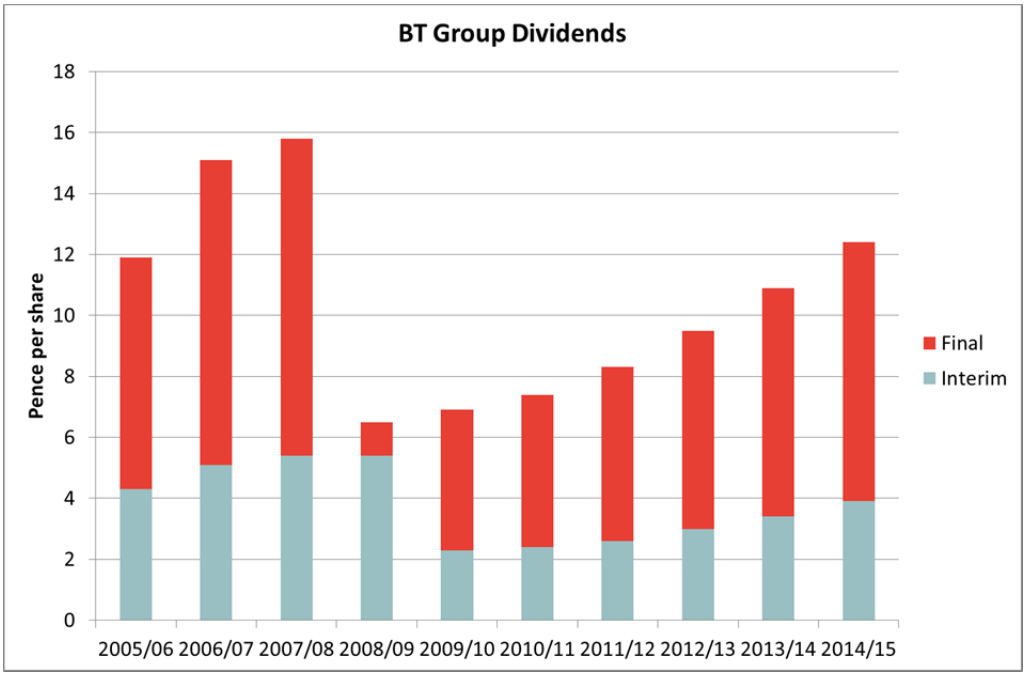
"this business is going to be measured on the basis of cash, it's the key criteria we are asking you to measure us, it's the key criteria we are using ourselves to measure our performance."[5]

3 BT Group plc Q4 2008/9 and full year results 14 May 2009.

4 While the recession also had an impact on other divisions, the impact was much less pronounced.

5 BT Group Plc Fourth Quarter Results 14 May 2009: Group Finance Director - Tony Chanmugam.

Figure 1. BT dividends

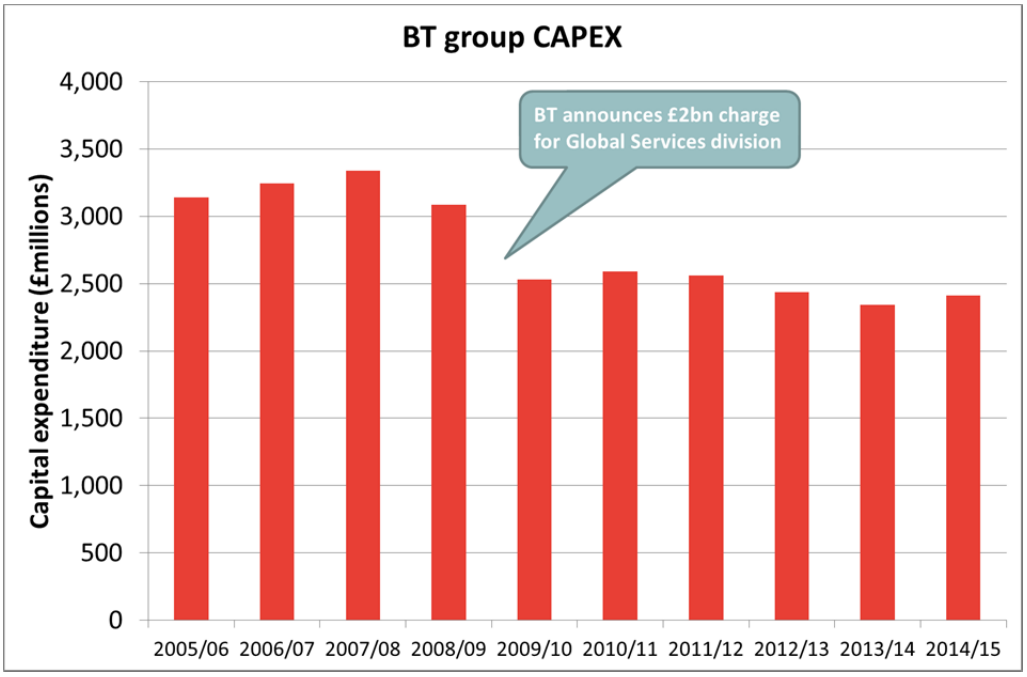


Source: BT

Reflecting the reduced expectations of future cash flows, largely unrelated to the performance of Openreach, BT announced sharply reduced capital expenditure targets for 2009/10, from £3.1 billion previously to £2.7 billion.[6] From 2009/10, BT's overall capital expenditure has remained at a much lower level than previously as shown in **Figure 2**.

6 The out turn expenditure was lower again at £2.5 billion for the year.

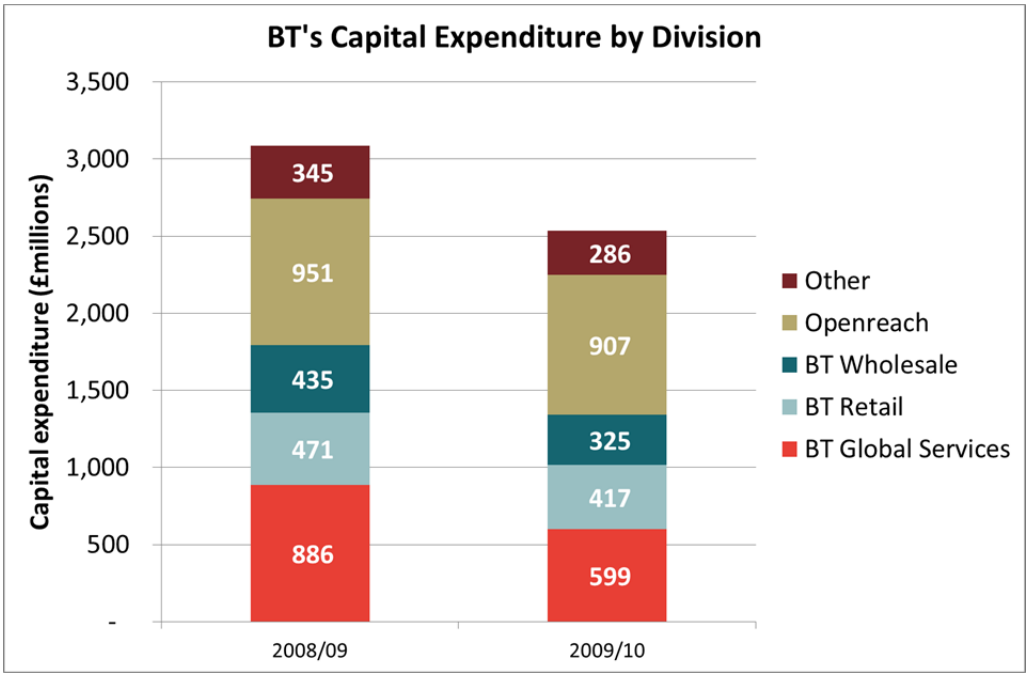
Figure 2. BT Group capital expenditure



Source: BT Published KPIs

The planned reduction in capital expenditure in 2009/10 was spread across all divisions as shown in **Figure 3**.

Figure 3. BT capital expenditure by division



Source: BT KPIs

1.2 BT's NGA Roll out

Standard broadband is offered to customers over Openreach's[7] existing copper access network. However, in order to offer superfast broadband (SFBB), Openreach has upgraded its access network by introducing into it more fibre and related equipment[8], so-called next generation access (NGA) technology.

BT's NGA roll out plans have evolved over time, with changing targets for both coverage (i.e. the proportion of premises passed by the network) and the ratio of fibre-to-the-premises (FTTP) compared to fibre-to-the-cabinet (FTTC).

1.2.1 Initial announcement

BT's roll out of the NGA network was initially announced in July 2008[9], starting in January 2009. At that time the roll out was planned to be 10% FTTP and 90%

7 Openreach being the BT division responsible for operating the access network.

8 Larger corporate customers were already increasingly served by fibre connections to their premises.

9 15-Jul-2008 - BT plans UK's largest ever investment in super-fast broadband.

FTTC[10] covering 10 million homes, or around 45% of homes in the UK. BT planned to invest around £1.5 billion in total on the programme, of which around £1 billion was incremental to BT's existing expenditure plans with the remainder being already budgeted expenditure for fibre deployment.[11]

At the time, BT expected its initial investment in the programme would result in around £100 million of incremental capital expenditure in each of the 2008/09 and 2009/10 financial years, taking the total expected capital expenditure in those years to around £3.2 billion and £3.1 billion, respectively. The remaining incremental spend of £800 million would be spread over the following three financial years.

This assumption that the NGA investment was to be largely incremental to existing capital expenditure meant that this would have had an impact on BT's free cash flow. BT justified the suspension of its share buyback programme on the basis of the investment required to roll out NGA:

> *"Given the strategic priority of this planned investment, the Board has decided it would be appropriate to suspend the current share buyback programme with effect from July 31, 2008. By that date BT will have returned in excess of £1.8 billion of the planned £2.5 billion buyback programme."*

1.2.2 Expanded roll out plans

Since its initial announcement, BT has made two further significant changes to its roll out plans.

First, at the end of 2008/09, at the same time as BT announced the charges related to its Global Services division, it also announced that the NGA roll out programme would be accelerated in 2009/10.[12] The investment, rather than being incremental to existing expenditure and funded through reduced pay outs to investors, would now be within the reduced group-wide capital expenditure target for 2009/10 of £2.7 billion.

Then in 2010, the planned roll out was further extended to cover two thirds of UK households by 2015, with a mix of 25% FTTP and 75% FTTC.[13] The expanded program was forecast to cost £2.5 billion with BT stating that "*we are going to manage that within the current capex levels*"[14], i.e. group-wide CAPEX would remain around £2.5 billion. This implied that the incremental expenditure

---

10 2009/10 Q4 and Full Year Results.

11 Presumably this was because some existing fibre deployments originally planned for corporate customers could be also shared with NGA roll out for mass market customers.

12 BT Group plc Q4 2008/9 and full year results 14 May 2009

13 2009/10 Q4 and Full Year Results.

14 Q4 and Full Year Results Thursday, 13th May 2010 Transcript

required for the NGA roll out would be offset by a reduction in non-NGA related expenditure.

1.2.3 Roll out to date

By May 2014, BT announced that it had largely completed the 'commercial' roll out of the NGA network covering 19 million households (approximately two thirds of UK households). The vast majority of the network rolled out has been FTTC. The annual run rate of capital expenditure on the network was between £300 million and £400 million in May 2013[15] - if this rate was typical of the level of capital expenditure over the five years then the total expenditure was significantly lower than originally forecast (i.e. between £1.5bn and £2.0bn). A lower spend could reflect a higher proportion of FTTC deployment, which has lower cost compared to FTTP deployment, offset by the somewhat greater coverage than planned.

The further rollout of the NGA network is being funded by BDUK, with total public subsidy of approximately £1.7 billion[16]. This is planned to increase coverage of SFBB to 95% of UK households by December 2017.

1.3 Summary

From 2009/10, BT has significantly reduced overall capital expenditure, driven by BT management's focus on increasing cash flow. At the same time, BT has invested heavily in the roll out of its NGA network. The combination of these two factors means that capital expenditure excluding NGA has fallen sharply from the level in 2008/09.

15 BT Q4/full year 2012/13 results and business update – Part 2 10 May 2013.

16 National Audit Office: The Superfast (Rural) Broadband Programme: update January 2015

2 BT's investment in access networks

In this section, we 'drill down' into published information on investment by BT in the access network. We look at three main sources of information:

1. Openreach capital expenditure data;
2. BT's published data on capital expenditure on "access" assets; and
3. Ofcom's regulatory asset value (RAV) model, which includes information on capital expenditure on ducts and copper cable.

Each information set above differs in scope but in general: the expenditure on copper cable and duct (3. above) should be a subset of the expenditure on "access" assets (2. above), which again should be a subset of Openreach's overall capital expenditure (1. above).

All the information sets from all three sources are consistent with Openreach significantly reducing its capital expenditure on its copper network and the underlying infrastructure.

2.1 Openreach and access networks

2.1.1 Openreach capital expenditure

Openreach is the BT division that operates the local access infrastructure - such as ducts and poles, the fibre and copper cables that run over/through them, along with the street cabinets and local exchanges - used to provide wholesale access services. Openreach offers wholesale access to other communications providers and to other BT lines of business, with the prices for the majority of its output being capped by Ofcom. The wholesale access services provided by Openreach include access to the traditional copper cable network, to the fibre network used to provide services to corporate customers and access to the NGA network.

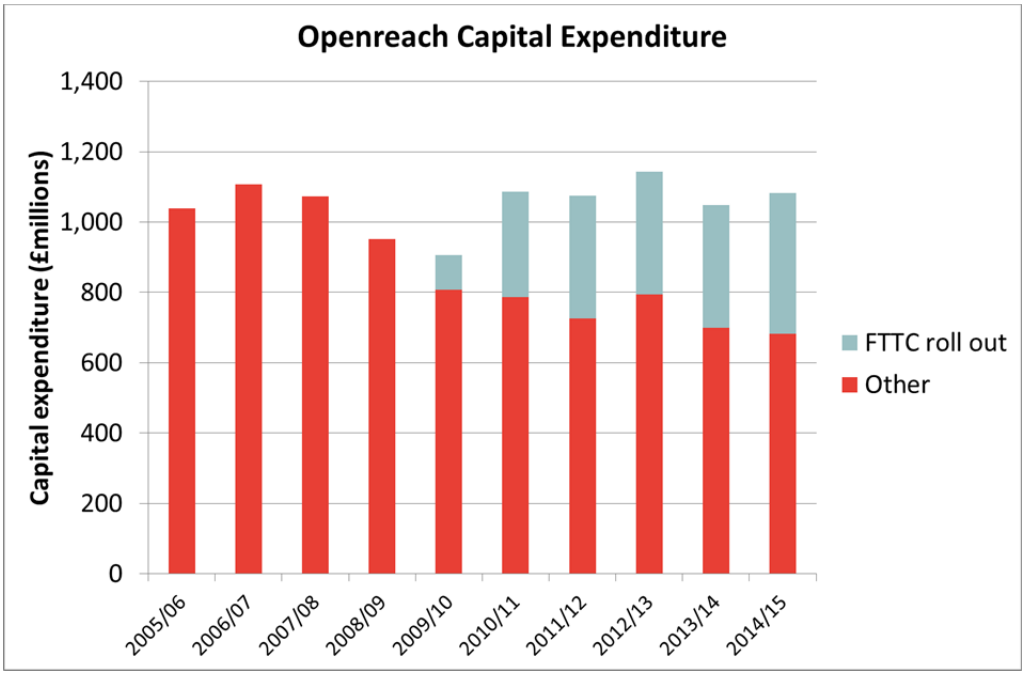
Openreach's capital expenditure in the last decade has been relatively stable - as shown in **Figure 4**. This is despite a significant increase in the scope of Openreach's network, with growing investments in access fibre and significant roll out of the FTTC network[17] being added to BT's existing copper network. In this regard, it is important to note that the FTTC network does not replace the existing copper network but is instead an 'overlay' network which still relies on

[17] The scale of Openreach's mass market FTTP roll out has been far more modest to date. It has largely been deployed only at new housing and business developments where there was no existing copper network and, therefore, the incremental cost of deployment was similar to FTTC.

the existing copper network to connect from the fibre-enabled street cabinet to the end user.[18]

Therefore, adjusting for the incremental NGA expenditure shows that the overall capital expenditure on the rest of the Openreach's activities (including on the existing copper network) fell.

Figure 4. Openreach capital expenditure



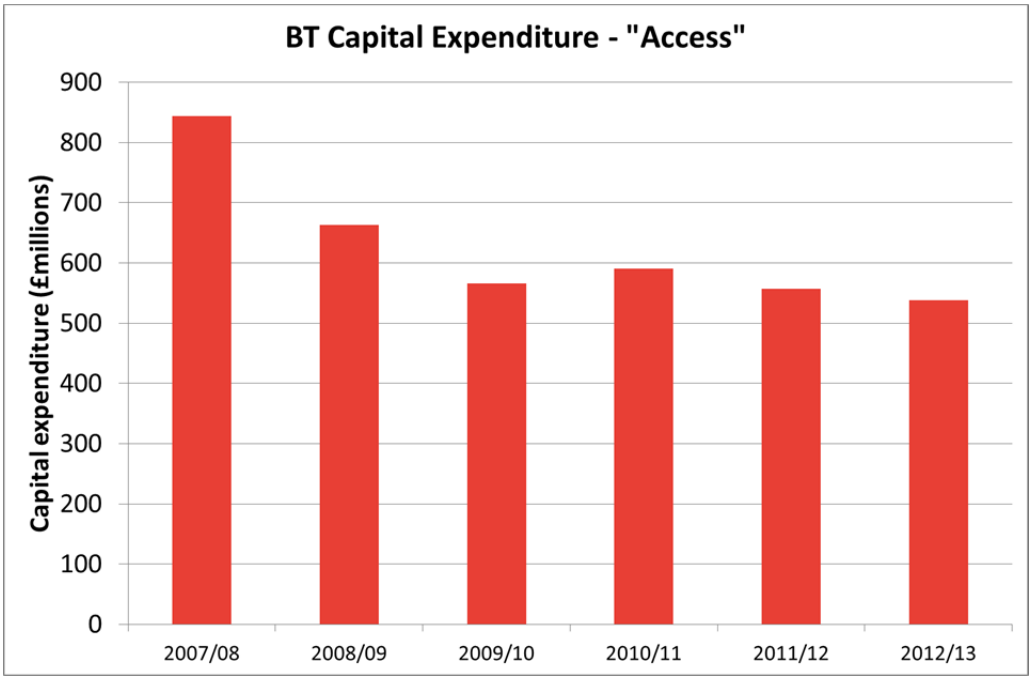
Source: BT KPIs and Frontier estimates

This pattern is also confirmed by data on capital expenditure on "access", previously published in BT's KPIs, shown in **Figure 5**. We assume this data covers both fibre and copper cables and the associated infrastructure, but excludes active FTTC equipment and related infrastructure such as cabinets.[19] This shows that the reduction in BT's overall capital expenditure from 2007/08 to 2009/10 was disproportionately concentrated on the "access" network, with a reduction of 33% in the level of capital expenditure compared to 24% for BT as a whole.

18 BT's implementation of FTTC also relies on the existing copper loop from the end user to the local exchange to provide a voice service.

19 Expenditure on FTTC equipment appears to be included in the separate line 'Platform/Network'.

Figure 5. BT "access" capital expenditure[20]

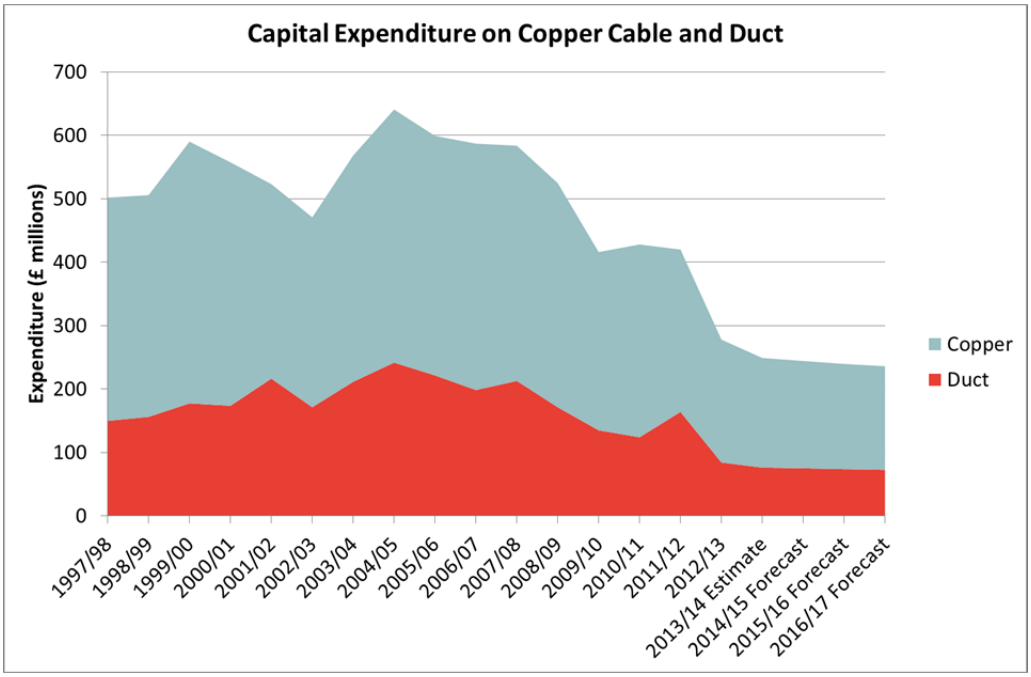


Source: Frontier analysis of BT KPIs

Further information on capital expenditure on ducts and copper cable is also separately available in the regulatory asset value (RAV) model used as an input to the charge controls for WLR and LLU services. **Figure 6** shows the CAPEX on duct and copper cable over a long time series, with a considerable reduction in recent years, to around a half of the level up to 2008/09.

20 BT only published separate data on access capital expenditure in its regular KPIs for the time period shown in the chart

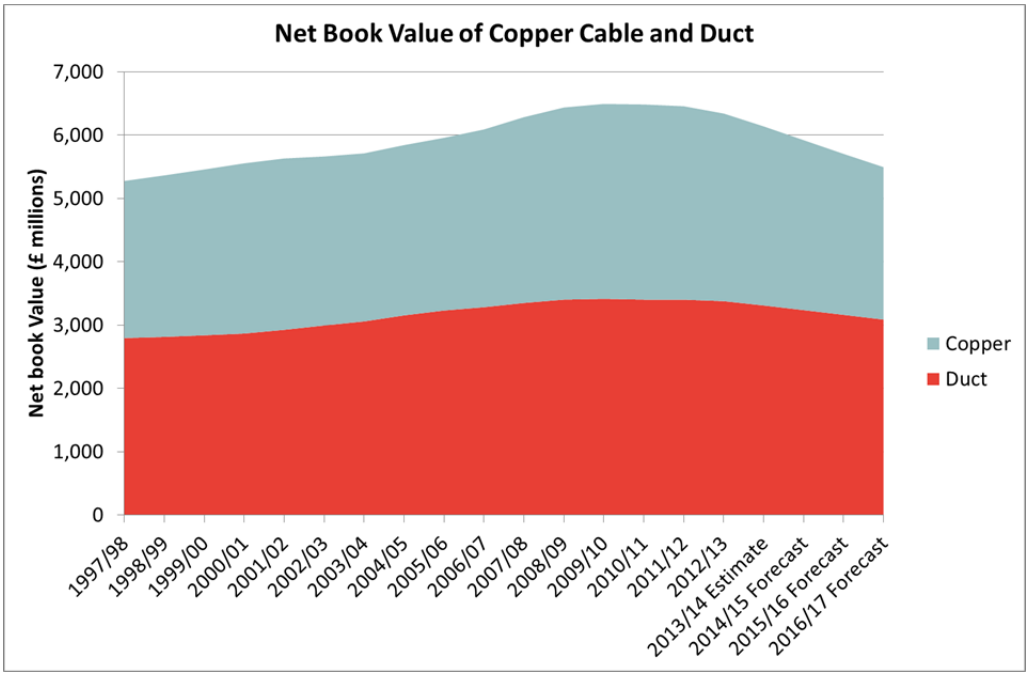
Figure 6. Duct and copper capital expenditure



Source: Ofcom RAV model

The result of this reduction in capital expenditure on copper cable and duct is that the net value of the asset base, on a historic cost accounting basis (HCA), has begun to decrease, i.e. HCA depreciation of the asset base has exceeded capital expenditure since 2009/10 as shown in **Figure 7**.

Figure 7. Net book value of copper cable and duct



Source: Ofcom RAV model

Capital expenditure can be incurred for two main reasons:

- to extend the scope or capability of the network; and
- to replace assets that have reached the end of their useful life or which have degraded over time.

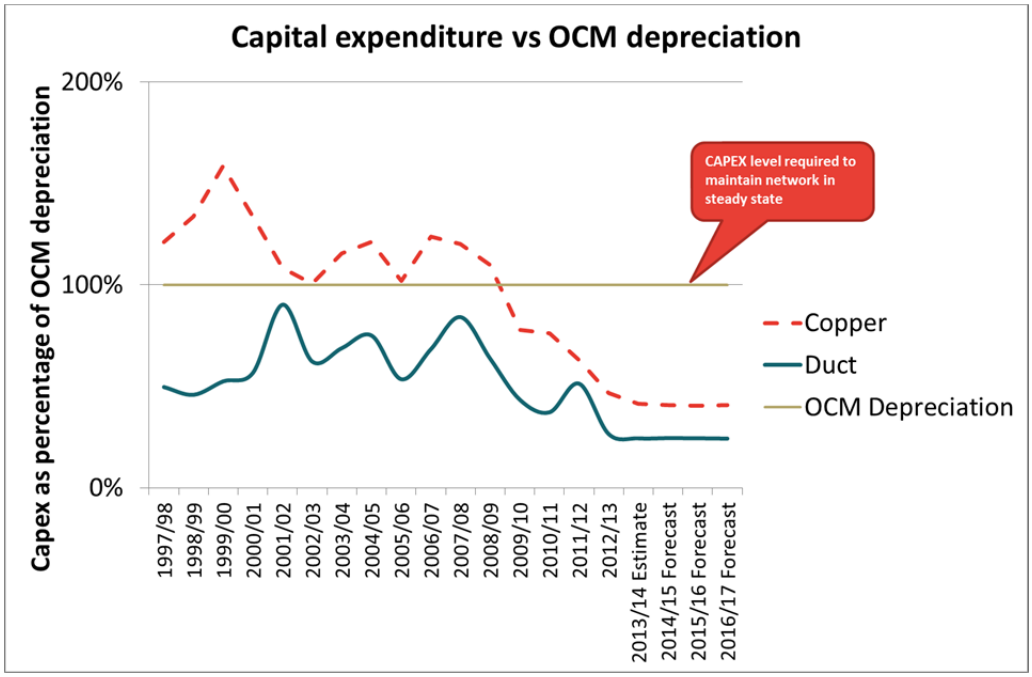
The number of Openreach copper lines is relatively stable, meaning that the overall network dimension is broadly static, i.e. that the reduction in value apparent in **Figure 7** does not reflect a shrinkage of the asset base in terms of capacity. This suggests that assets are not being replaced as quickly as they are depreciating.

From the perspective of network quality, the critical issue is whether the level of capital expenditure is sufficient to maintain the capability of the networks. An estimate of this level of capital expenditure, depreciation on an operating capital maintenance basis (OCM), is produced by BT for current cost accounting (CCA) purposes.[21] If capital expenditure is consistently below OCM depreciation, then the operating capabilities of the assets will be diminished in the long run.

21 BT is required by Ofcom to produce separated accounts on a CCA basis as part of the packages of remedies applied to BT, as an operator with Significant Market Power (SMP) in relevant markets.

Figure 8 shows that BT's investment in duct has been consistently below BT's estimate of OCM depreciation. Capital expenditure on copper cable was previously broadly in line with OCM depreciation but has declined in recent years. These results suggest that capital expenditure in these assets since the reduction in BT's capital expenditure is not sufficient to maintain the network in the long run, suggesting that overall the network is deteriorating over time.[22]

Figure 8. Comparison of capital expenditure and operational capital maintenance



Source: Frontier analysis of Ofcom RAV model

Reducing capital expenditure on the copper network could be an efficient strategy if demand on the network was expected to fall in the foreseeable future, as this could reduce the value of the assets 'stranded' by such a reduction in demand. However, the roll out and migration of subscribers to the FTTC network will not lead to a reduction in demand as the copper and duct network is still required to support both standard broadband services and SFBB services delivered over the FTTC network.[23] It would be inconsistent for BT to

22 An alternative explanation for this result is that BT's estimates of CCA depreciation are biased upwards, either because BT's estimate of the replacement cost of the network is overstated or because the assumptions on asset lives are understated and hence the rate of depreciation is overstated. If OCM depreciation is overstated this suggests that the charge controls related to these assets has been set at too high a level.

23 While part of the copper network on the 'exchange side' ("E-side", between street cabinets and local exchanges) is not used in the delivery of SFBB services, it is still required for subscribers to SFBB services because it is used to support voice services. In any event, the E-side network is also a

simultaneously reduce expenditure in the copper network on the assumption that it was obsolete, while making significant incremental expenditure on a FTTC network which relied on the continuing operation of the copper network.

Overall, all sources of information show a consistent picture: a significant and sustained reduction in investment in the copper access network far below the level required to maintain the network in a 'steady state'.

relatively small proportion of the total copper network, contributing only 11% of the capital costs of a copper line.

3 Impact of reduction in access network investment

3.1 Link between investment and quality of service

There is an acknowledged link between investment in the access network and quality of service, predominantly through the rates at which network faults arise. For example, prior to the sharp reduction in investment in the access network in 2008/09, BT implemented a program to seal joints in the copper network. This led to a dramatic reduction in fault rates:

> *"To give you one number, we've reduced the number of faults in our network by investing in our network by a third, so on average your access line will go down, you will have a problem once every 13 years and I apologise to those people who are the wrong side of that average. But that once every 13 years, 3 years ago was once every 9 years, in fact 2 years ago was once every 9 years, so a 30% improvement in the position. What's that mean in cost terms, roughly a million less repair jobs being done this year."*[24]

If such preventative maintenance programmes were foregone due to the subsequent sharp reduction in the capital expenditure budget, it would be expected that fault rates would increase. It appears that this type of capital expenditure was given lower priority from 2009:

> *"*[…]*some of the capital expenditure that we have incurred in the past, those sorts of programmes will not be undertaken. We will improve the timing of our capital, so the Capex is only invested in relation to customer demands. The timing will be that the capital investment and the pay backs will be much shorter* […]*"*[25]

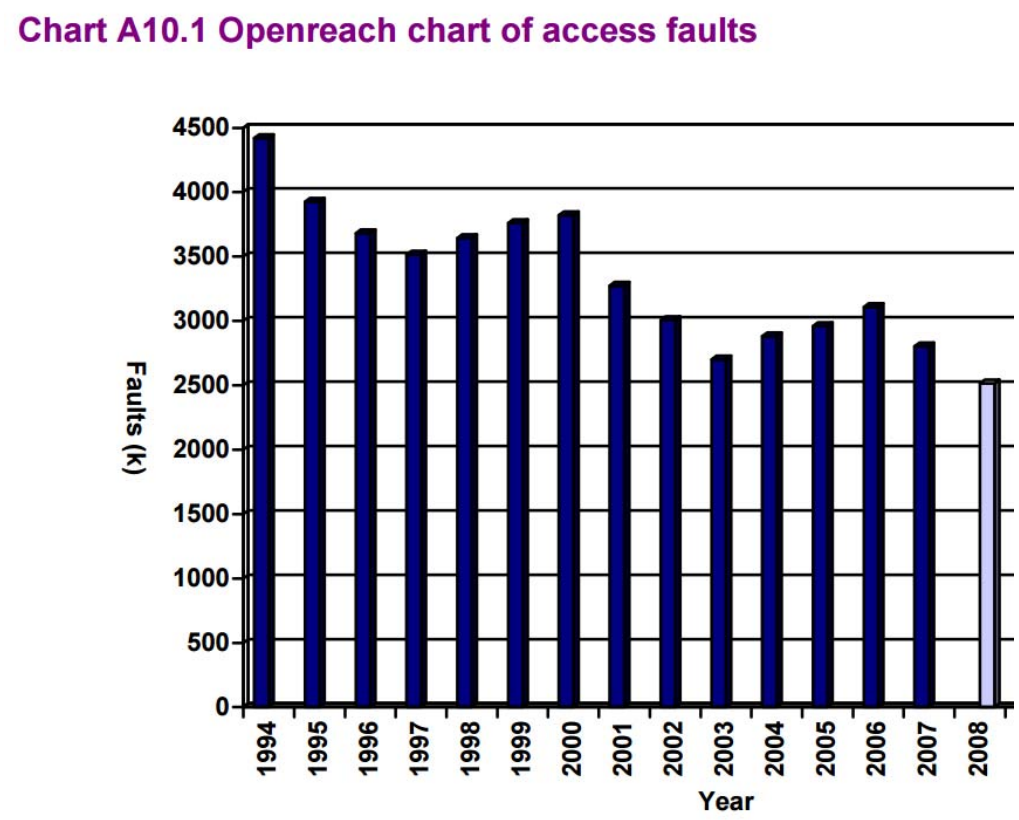
3.2 Impact of reduced quality of service

In the decade prior to 2009, there had been a long term downward trend in fault rates as seen in **Figure 9**.

24 BT Group Plc Fourth Quarter Results 14 May 2009. Ian Livingston.

25 BT Group Plc Fourth Quarter Results 14 May 2009.. Tony Chanmugam.

Figure 9. Openreach fault levels

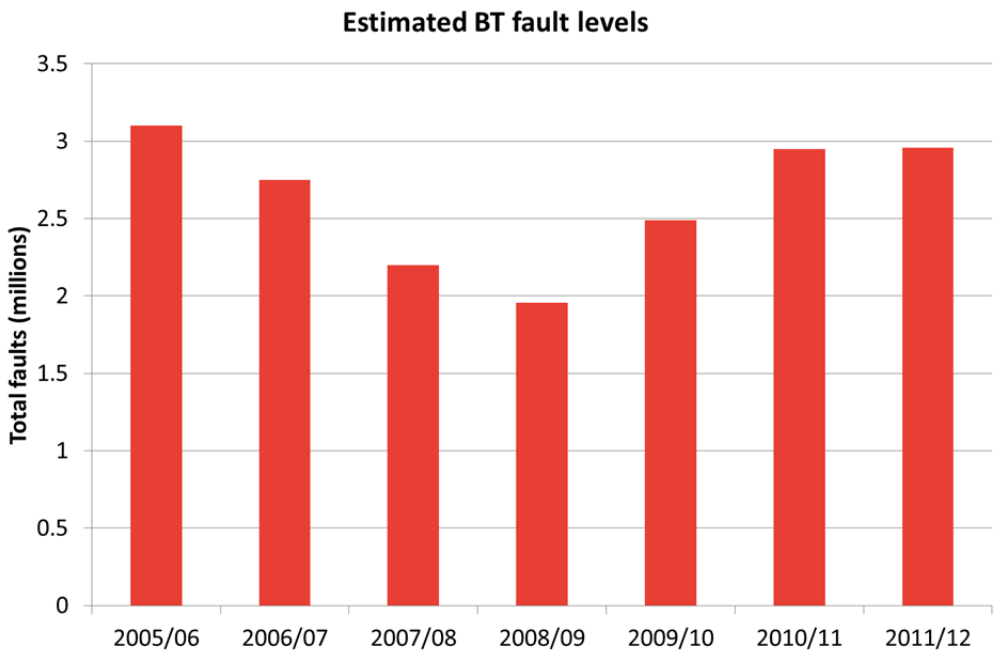


Source: A New Pricing Framework for Openreach Second Consultation Publication date: 5 December 2008

While BT has been unable to supply a time series of fault rates consistent with **Figure 9**, there is evidence that the fault rate on the copper access network increased materially after investment in the network was reduced, shown in **Figure 10**. This is consistent with a view that the quality of the network was adversely affected by the reduction in investment.

Impact of reduction in access network investment

Figure 10. Trend in copper faults



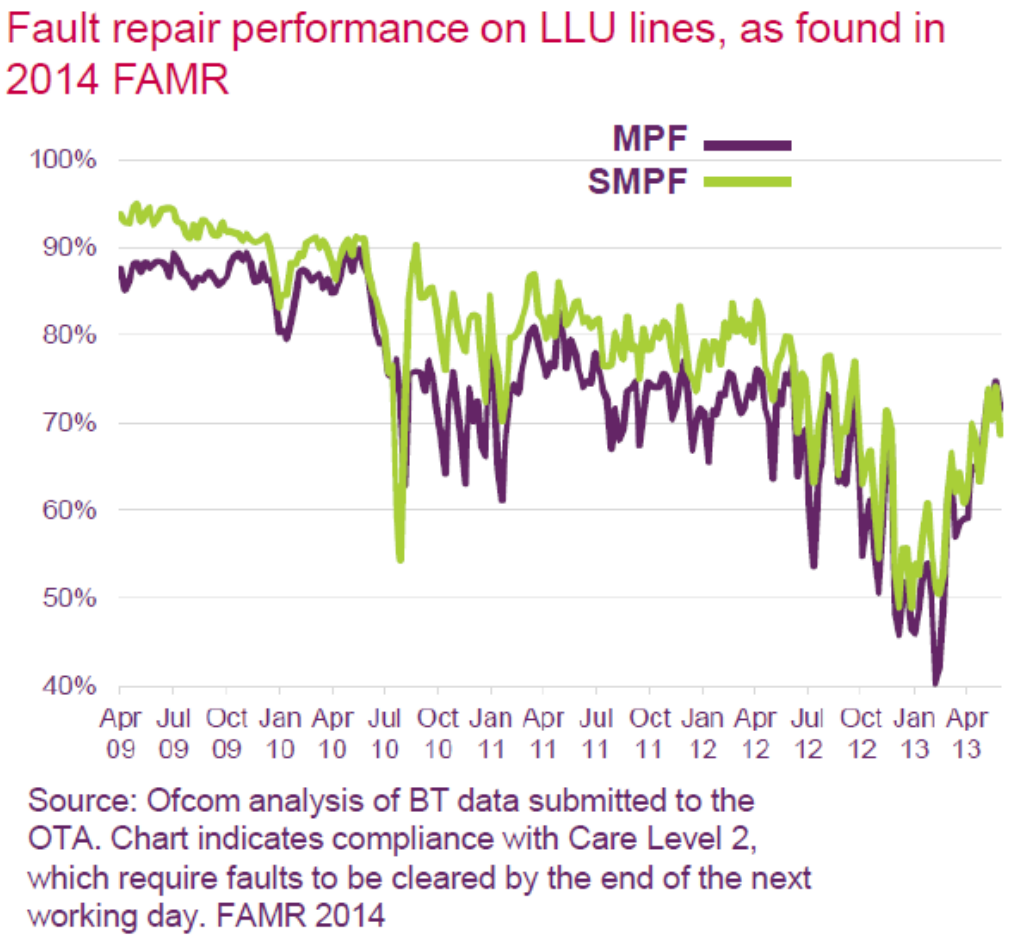
Source: Frontier estimates based on BT and data published by Ofcom.

While BT cited other reasons for the increases in fault rates, including worse than average weather and increased take up of broadband, these factors do not fully explain the increases in faults.[26]

The increased fault rate, coupled with reductions in the available Openreach engineering workforce, in part due to the roll out of the NGA network, meant that Openreach performance in repairing faults within target times deteriorated as shown in **Figure 11**.

26 Frontier Economics: Treatment of the level of faults in the LLU and WLR charge controls for 2014 – 17. February 2014

Figure 11. LLU fault repair performance



Source: Ofcom

To summarise, reduced investment in the access network may have led to reductions in the quality of service offered to wholesale customers and ultimately to end users in two ways:

- directly, through an increase in fault rates experienced by customers; and
- indirectly, as the increased resources required to repair the increased number of faults led to the Openreach labour force being stretched, leading to increased delays in fault repair and the provisioning of services.

Impact of reduction in access network investment

4 Conclusions

BT's overall capital expenditure was reduced significantly between 2007/08 and 2009/10 as part of BT's management drive to increase free cash flow. While Openreach's capital expenditure has remained broadly stable since then, this is a result of the combination of a sharp reduction in expenditure on the copper access network, offset by increases in investment in NGA roll out and other access fibre. The reduction in expenditure on the copper access network has been followed by significant increases in fault rates on copper lines. This in turn appears to have resulted in BT's engineering workforce being unable to meet quality of service targets for repair and provisioning, with at some points less than half of jobs being completed within target times.

In the remainder of this section, we consider whether there is an alternative explanation for the reduction in capital expenditure than short term cash flow maximisation, either in terms of efficiency or long term profit maximisation.

4.1 Efficiency of reduced investment

4.1.1 Productive efficiency

The reduction in investment does not appear to reflect a dramatic increase in investment efficiency over the period through reduced unit costs. If BT had identified methods of reducing unit capital expenditure in the access network, this should have been reflected in its CCA estimates, which would have led to BT reporting lower replacement costs for the network. However, BT in 2010 introduced a significant upward revaluation of its duct network reflecting an increase in assumed unit prices of 38.2%[27], which is inconsistent with the assumption that unit costs had fallen. In a response to Ofcom, Openreach suggested that efficiency gains in installing duct, after taking account of input cost increases, were no more than 0.5% per annum[28] and as such unit replacement costs increased in nominal terms.

The reduced performance of BT's network, such as the increase in the reported fault rate, is also inconsistent with an assumption that the reduction in capital expenditure was due to increased efficiency, as any efficiency gains would have left the quality of the network at least unchanged.

It is not even clear that the reduced level of capital expenditure is cost minimizing in the long run as the increased fault rate will lead to increased

27 BDO Review of the BT Duct Valuation 2009/10 Report March 2011.

28 Charge control review for LLU and WLR services Openreach response to the Ofcom consultation dated 31 March 2011 July 2011, paragraph 139.

operational expenditure required to repair faults in the future and this could offset the reduction in capital expenditure.[29] While the CPI-X type charge controls applied by Ofcom should encourage BT to reduce costs in the short term, this incentive will be dampened if BT considers that it can successfully argue that any increased operational expenditure, for example to bring quality of service up to acceptable levels, can be included in the cost base (and therefore prices) for future charge controls.

4.1.2 Allocative efficiency

Even if the reduction in investment were cost minimising in the long run, this would not necessarily make the reduction in investment efficient in the sense of maximising allocative efficiency. Customers may have a higher willingness to pay for improved quality of service, in this case reduced fault rates. As such, an efficient outcome will balance an increase in expenditure and hence prices, with the willingness to pay for an improved quality of service.[30]

4.2 Profit maximisation

The majority of the output of the copper access network is price regulated via the charge controls on WLR and LLU services. Ofcom uses a regulatory asset value approach to calculate capital charges for the charge control, which means that BT can expect to earn a return on any incremental capital expenditure through higher future regulated prices. To the extent that the regulated rate of return is appropriate, a reduction in capital expenditure would be matched by reduction in future regulated revenues due to a corresponding reduction in the regulatory asset base and hence future cost based prices.[31] The reduction in prices should have a broadly equal present value to the reduction in capital expenditure. As such, incremental reductions in capital expenditure would not materially increase shareholder value.

However, because the asset lives of access network assets are long, reductions in capital expenditure would increase cash flows in the short term as the (regulated) returns on the investment through increased prices would be spread over the life

29 The delay between the reduction in capital expenditure and the resultant increase in faults may still mean that reductions in capital expenditure increase cash flow in the short term.

30 Estimating this efficient level of investment is clearly challenging, both in terms of identifying willingness to pay for increased quality of service and modelling the link between investment and quality of service. Regulators such as Ofwat and Ofgem have attempted to determine whether incremental investment is welfare enhancing.

31 Through reductions in the capital charges corresponding to depreciation and a return on capital employed

of the assets (e.g. 40 years for duct).[32] As a result, if BT aims to maximise short term cash flow, it may forego investment in the access network, even if this investment was marginally profitable, or at least neutral, in the long run.

4.3 Conclusion

The reduction in investment in the copper access network appears to be neither efficient nor necessarily profit maximising, but instead driven by a desire to maximise cash flow in the short term following difficulties in BT's Global Services division at a time of increased spending on NGA roll out.

This reduction in capital expenditure appears to have led to a reduced quality of service and may in the long run lead to an increase in the costs of operating the access network. As such, the reduction in capital expenditure may lead to worse outcomes for end users.

32 The payback on incremental capital expenditure (the time before the cumulative increase in revenues exceeded the initial investment) is correspondingly long.

FRONTIER ECONOMICS EUROPE
BRUSSELS | COLOGNE | LONDON | MADRID

Frontier Economics Ltd 71 High Holborn London WC1V 6DA
Tel. +44 (0)20 7031 7000 Fax. +44 (0)20 7031 7001 www.frontier-economics.com