Response to DCMS Consultation

This response is based on my own direct observations working as one of the few consultants specialised in fibre access internationally. In the past I was the first consultant employed at Analysys (now Analysys Mason) and in 1993 I wrote the report that initiated local loop unbundling in Europe. More recently I have advised many operators and Governments around the world and also have direct fibre broadband operating experience as a part owner of a successful open access fibre operator in Sweden. We are now taking that open access to various other markets around the world.

In essence, **my view is that it is now simple common-sense to set a policy goal of a fibre switchover and to start driving the changes in regulation and incentives needed to accomplish this, without major cost to the taxpayer, to the benefit of citizens and businesses both as a result of lower than otherwise bills and also much, much better broadband.** To summarise my argument:

- Fibre access (FTTH / FTTP) not only provides a much better experience for the customer but is also cheaper in the medium term with on average 20% lower operating costs. Much better broadband will be *widely* popular but lower bills will be *universally* popular. There is also growing evidence that fibre broadband contributes to productivity, competitiveness and GDP growth.
- UK broadband prices are fair but our infrastructure has fallen behind that in many other countries and our relative positon is worsening steadily. It is well known that even around "Silicon Roundabout", right in the heart of London, many innovative companies struggle with terrible broadband. This is a national disgrace. This consultation is a welcome sign that past complacency may be coming to an end.
- Let there be no doubt that our country is a long way behind in the fibre switchover – here are just a few examples of what other countries have achieved:
  - New Zealand is progressing faster than planned towards its UFB (ultra-fast fibre broadband) target of 75% FTTP nationwide by 2020 and may revise up to 80%;
  - Singapore is now more than 95% switched-over;
  - Closer to home, Jersey is part way through a complete fibre switchover (we advised Jersey Telecom and helped implementation) and the Republic of Ireland continues to develop its policies and programmes with the Electricity Supply Board (a Ventura client) and others committing to investment in FTTH;
  - The UAE completed its switchover last year and Qatar, Oman & Bahrain are all in progress to varying degrees;
  - Japan is about 70% complete;
  - Sweden is >55% done and private investment is driving into more remote areas;
  - The Netherlands has millions of FTTH and continues to make steady progress at little or no cost to the taxpayer;
  - Even the USA is installing fibre to millions of homes each year even in the face of a poor regulatory system and the political power of the cable lobby.

- BT is already paid through its regulated tariff process to modernise its access network right up to the home (including even to the most remote cottage) at the rate of 3%-4% each year, yet it manifestly fails to do so even though CAPEX levels overall seem reasonable.[i] On the contrary, BT has taken very large amounts of money from the taxpayer for only modest improvements in rural broadband providing derisory value for money as highlighted by the Public Accounts Committee earlier this year. While it is clear that BT is a large part of the problem and cannot be trusted in future initiatives they are acting rationally in their short term interests as they should – the real issue is that the regulatory and policy framework charges the public for nationwide modernisation which then never happens. This regrettable state of affairs is the result of an understandable yet fundamental mistake in the design of the regulatory framework back in the 1980s which overlooked the issue of copper obsolescence and the natural monopoly nature of the access network particularly outside urban areas.

- Clearly, we need a new approach. New Zealand, and the other countries listed above, have each made such "pivots" in policy in order to modernise their own infrastructures. There is much the Government could learn from the leaders including what not to do (see in particular Australia). In my view the only common-sense goal for the UK is to aim for a complete fibre switchover. It will take ~15 years or so to achieve but we should set a clear goal now in order to drive policy and regulation in the right direction and to provide the foundation of a re-designed long-term stable regulatory framework that enables substantial private investment.

- I have spoken to numerous leading financial institutions and it is absolutely clear that money for FTTP is there in abundance, provided that regulatory and financing structures are appropriate and stable. Customers already pay for timely modernisation to all promises nationally in their monthly bills. The problem is entirely one of industry structure, incentives and regulation rather than of return on investment or affordability.

- There may be a combination of measures that could unlock a great deal of private capital to modernise with fibre although sadly there is no simple formula – various factors were discussed in my 2012 report (see url below) including modernising the definition of Universal Service, calculating it more realistically and using it to help fund the fibre switchover in rural and disadvantaged areas.

- The cost to Government need not necessarily be that high in my view - indeed capturing many billions of globally mobile capital to fund extensive civil works right across our country is likely to boost tax receipts, quite possibly leaving Government with a net financial gain from the switchover.

The background and some of the analysis behind this opinion can be found in my public report about financing fibre broadband which is at:
http://www.ftthcouncil.eu/documents/Reports/FTTH_Finance_Report.pdf.

Customers would enjoy bills lower than otherwise in future (and much improved broadband) if the UK had an all-fibre access infrastructure

It is well known that fibre to the premises (FTTP) brings dramatic performance and customer experience benefits (see section after next). What is less widely recognised is that such networks also cost less to own and operate. This means that even if there were no performance benefits, for the sake of national competitiveness and the consumer interest (which Ofcom has a duty to pursue) UK policy should be fostering investment in FTTP as widely as possible. Productivity gains (getting more bang for the same or less buck) are, after all, a fundamental driver of economic progress and improving quality life. There would also be the added bonus of a reduced carbon footprint.

Why do I believe that fibre networks are lower cost? In my conversations with operator CTO's around the world the common view is that fibre access will yield between 15% and 30% reduction in operating costs. What drives such savings varies depending on local conditions but typical factors are much more robust physical infrastructure, local node consolidation, lower power consumption, reductions in faults particularly as water ingress largely falls away as an issue, simplification of operating processes and customer service workflows based on modernised IT systems, making explicit internal interfaces enabling x-efficiencies and so on. Clearly, some of these may not become apparent in the short term as they require a whole series of organisational and business process changes to ripple through an operator. This always takes time.

Nonetheless, the potential cost reduction with fibre is significant and permanent. Incumbent operators tend to be cagey about such information of course because it's not in their interests to advertise a lower regulatory cost base. The only published study I'm aware of is at http://www.ftthcouncil.org/p/bl/et/blogid=3&blogaid=182 and cites an average 20% like for like operating cost reduction being achieved in practice by US operators migrating to FTTH.

Such efficiencies are not unique to smaller operators of course – Verizon (a rough US regional equivalent of BT) for example notes on page 15 of its 2010 annual report that "*Through our deployment of the FiOS network [FTTH], we expect to realize savings annually in our ongoing operating expenses as a result of efficiencies gained from fiber network facilities*".

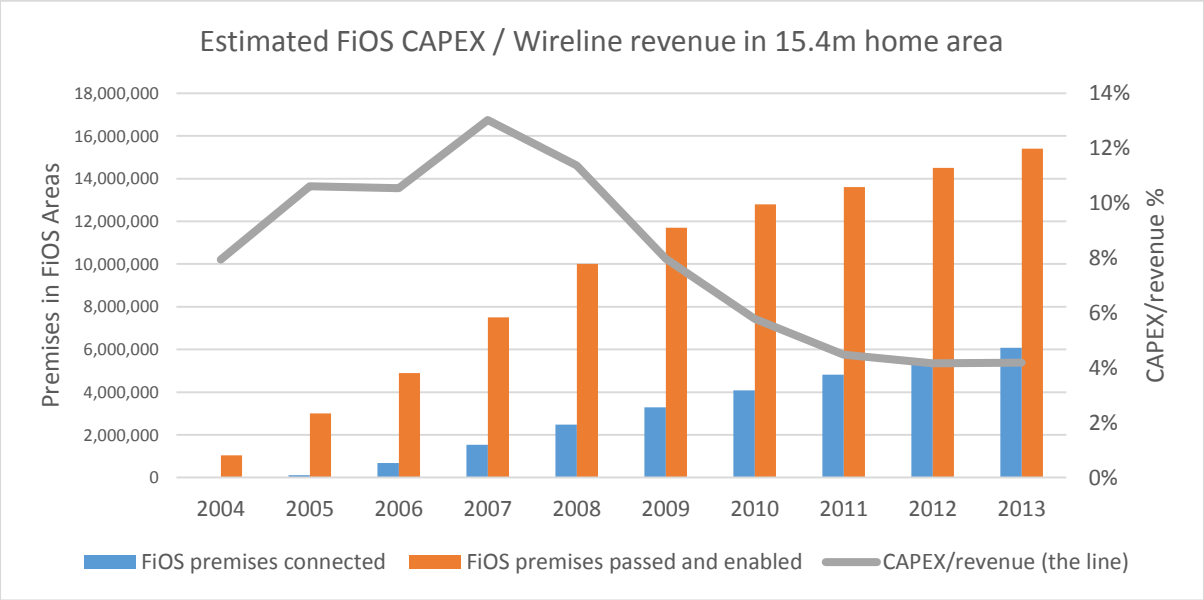
It is perhaps worth noting that Verizon's FTTH programme, known as FiOS, now passes over 16 million US homes (>70% of the Verizon footprint) after exactly 10 years (from September 2004) of geographically selective but sustained investment. In some local jurisdictions Verizon even secured tariff rises in return for its investment in a lower cost network (a fantastic piece of rent seeking by lobbying). Fibre has also helped them enter the TV market further increasing revenues and defraying the investment in fibre.

Broadband and access prices already pay BT for a sustainable rate of investment in FTTP - but that investment is simply not happening

UK regulatory policy has been effective compared to many countries in terms of retail broadband prices. Our country enjoys reasonable, perhaps even slightly low, prices for broadband. The UK system should be effective in ensuring investment in fibre ultimately leads to lower prices than customers would otherwise pay for maintaining the *dogs breakfast* of increasingly complex and fragile electronics advocated by the copper lobby. Ironically perhaps the strong growth in BT Openreach's fault rates for broadband, CP order failure rates (apparently up to 30%) and protracted provisioning lay bare the high costs and third rate performance that current pro-copper policies impose on the country.

Interestingly for policymakers, Verizon's mass deployment was achieved without disturbance to the overall level of CAPEX nor much if anything in the way of taxpayers money. For a useful discussion of the negligible impact on Verizon's overall CAPEX see:
http://www.huffingtonpost.com/bruce-kushnick/the-great-verizon-fios-ripoff_b_1529287.html

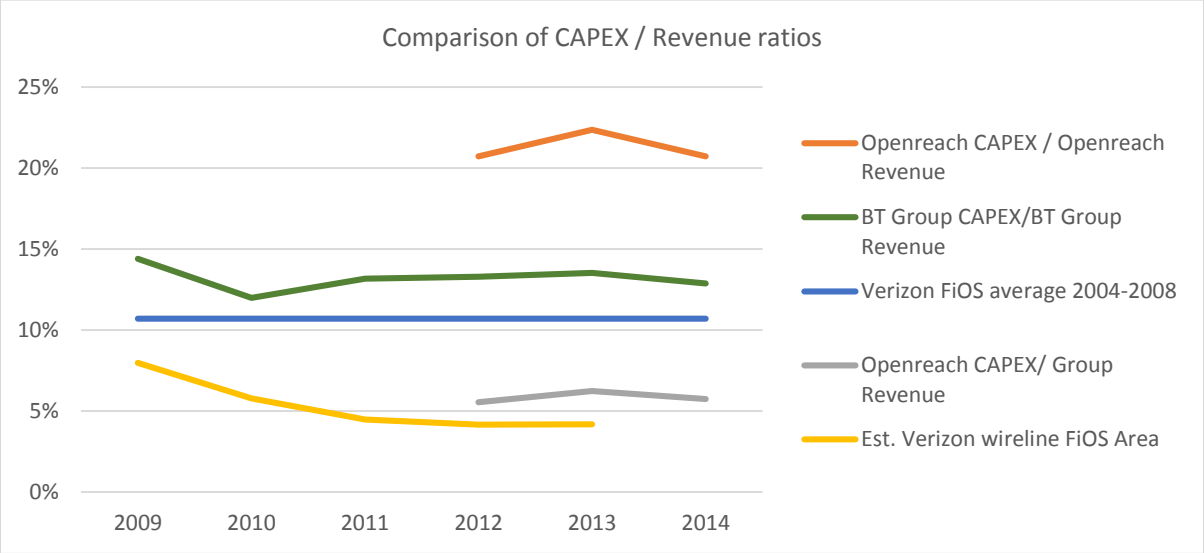
My own analysis of Verizon's numbers supports the view that the modernisation programme was easily affordable. My analysis draws on various sources and is based only on the revenue generated by wireline customer in those same areas (I am using the 15.4m premises passed at end 2013 as the relevant footprint).



Opinions change over time as to what a sustainable CAPEX/revenue ratio is and, it varies between fixed and mobile with sentiment, but ~10%-15% is my own rule of thumb. Given this, although the first half of the FiOS programme seemed to require most of the sustainable level of wireline CAPEX in those areas, in the second half of the programme the level of FiOS (FTTP) CAPEX was quite low compared to the wireline revenue generated in those areas.

My back of an envelope analysis suggests that our problem here in the UK is not necessarily one of BT's overall intensity of investment (although I think the implied loop asset refresh cycle for Openreach is too long) but the lack of focus on infrastructure.

For example, Ofcom assumes an asset life for overhead copper drops of 18 years when setting regulated tariffs. This implies that around an average of 5.5% of these drops should be replaced each year, and in my view nowadays that should only be done sensibly with fibre. My guesstimate is therefore that ~500K premises served by telegraph poles should be switched-over to FTTP each year and of course the customer already pays enough through Ofcom's regulated tariffs for this to happen while also providing Openreach a healthy return on that investment). Self-evidently, however, such replacement is simply not happening.



Based on this admittedly extremely simple comparison, one might conclude that if Openreach prioritised a gradual fibre switch-over then CAPEX would need to roughly double for 4-5 years based on FiOS 2004-2008 as a rough guide. Thereafter it would fall back but deliver ~70% FTTP over 10 years. I have no doubt BT will vigorously dispute these very rough numbers.

At the moment Openreach accounts for about half of BT Group CAPEX so it seems that a re-prioritisation of investment in favour of FTTP would surely be feasible without that much increase in the Group total, even if desperately unpopular with other parts of the BT Group. Bear in mind that BT Openreach is already paid through the regulatory price setting mechanism to replace its infrastructure in a timely fashion while also making a healthy rate of return.

I am not sure what BT's current allowed rate of return is (aka WACC) but a BT presentation from June 2012 has it as 8.8% for Openreach copper products. This compares to a typical figure of 3%-4% for analogous utilities suggested to me recently by a major global infra investor. It is true that in its current operating structure Openreach has a much higher mix of technology than would be the case for water or electricity which are dominated by passive assets. This would push up the correct WACC for Openreach a fair bit above 4% but, nonetheless, my strong suspicion is that a WACC of 8.8% (if it is still applicable today) allows Openreach a very generous return on passive assets many of which are life expired. Surely then it is quite reasonable to expect assets to be renewed and modernised in a timely fashion?

FTTP makes the Internet twice as useful – our citizens and businesses are getting only half the value enjoyed by their counterparts abroad

We know from our own network fibre broadband operating experience - and from various telco clients - that customers moving from xDSL to fibre consume between two and three times the volume of data that they used to on copper. I have at least three specific examples of this effect from different countries on my desk as I write this response and I also know from our own fibre operating experience that this is commonplace.

Think about that for a moment: same people, same devices, same applications but at least twice the traffic simply as a result of switching to FTTH broadband. There is nothing inherent in the fibre access technology that would artificially increase data consumption – it is simply driven by an all-round better broadband experience. In that sense the Internet becomes twice as useful to the customer.

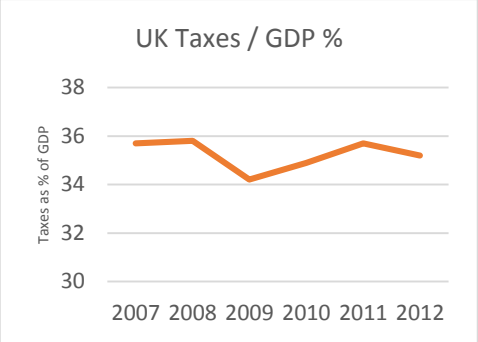
In the past, debates about the merits of fibre broadband focussed only on headline speeds but for most customers these are not particularly relevant above 100M except insofar as giving you bragging rights if you have a Gigabit at home. What counts is the overall superior combination of factors like ability to burst, latency, much better reliability and lower packet loss. For example, xDSL imposes latencies of between 35ms and 70ms on average whereas a fibre network is typically 5ms to 10ms, depending on the geography of the network and country concerned. A few milliseconds may not seem like much but that delay is experienced thousands of times each day and very directly in gaming. In terms of the general responsiveness and customer experience of the Internet it has an impact along with the other factors.

I believe that it is the *combination* of these performance improvements – underpinned by much better reliability – that doubles the traffic or more. This is why I would describe the fibre to the home Internet as being twice as useful as legacy xDSL - customers vote with their clicks and use, on the same devices in the same domestic context, at least twice as much data with real FTTH broadband. In arguing that people do not need (and therefore should be denied the choice of) fibre speeds, the copper lobby misses the real point about performance.

Modernisation could probably be achieved at modest cost to the taxpayer – in fact the process could yield a net gain for the Treasury

There is a widely quoted figure of £20 billion for the cost of "fibreing" the UK which seems to me to be reasonable for a completely new infrastructure but perhaps too high in practice if BT were motivated and/or enough political will and regulatory effort were invested in getting PIA to actually work.

It is a truism that 70%-80% of the capital cost of FTTP is in the civil works which means that the £20 billion figure implies around £15 billion of labour costs. Of these the Treasury should immediately capture around one third as a result of income taxes, NI, VAT etc.[ii] If a policy can be found that taps international institutional capital for the fibre switchover, it will bring significant infrastructure investment, jobs and tax revenues to the country.



As I argue in the rest of this submission, the great majority of a fibre switchover could be privately financed and indeed the customer is already paying such costs in their monthly bills (although the money seems to be diverted to other purposes at the moment). If USO is modernised and certain other steps taken, then I believe a leverage effect over some years of say 7:1 to 10:1 on a modest amount of public money should be achievable. This implies public sector intervention of ~£3 billion which compares to enhanced tax revenues on civil works alone of £5 billion, with more to come later from spill-over and multiplier effects.

<u>It is not clear therefore that a well-crafted fibre switch-over policy would generate a net cost to the State – there should in fact be a surplus.</u>

Another point worth noting is that both the initial employment stimulus and also the enduring productivity & quality gains resulting from a fibre switchover would *benefit each and every community in the country*. This is in stark contrast to the highly localised benefits of many other types of infrastructure project.

The UK has fallen behind many competitor nations in terms of the quality and fitness for purpose of fixed broadband infrastructure. This matters because it imposes on our businesses higher than necessary prices, greatly inferior services, low productivity.

Let there be no doubt that our country is a long way behind in the fibre switchover – here are just a few examples of what other countries have already achieved:

- New Zealand is progressing faster than expected towards its UFB (ultra-fast fibre broadband) target of 75% FTTP by 2020 and may even revise the goal upwards to 80%;
- Singapore is now more than 95% switched-over;
- Closer to home, Jersey is part way through a complete fibre switchover (we advised Jersey Telecom and helped implementation) and the Republic of Ireland continues to develop its policies and programmes with the Electricity Supply Board (a Ventura client) and others committing to investment in FTTH;
- The UAE completed its switchover last year and Qatar, Oman & Bahrain are all in progress to varying degrees;
- Japan is about 70% complete;
- Sweden is >55% done and mainly private investment is driving fibre into progressively more remote areas;
- The Netherlands has millions of FTTH and continues to make steady progress at little or no cost to the taxpayer;
- Romania has some of the fastest average broadband speeds in the world because of extensive fibre access in urban areas (rural areas are simply left behind at present);
- Kazakhstan is on track to have FTTH available across all urban areas by the end of 2016 and presumably will start to migrate customers thereafter;
- Even the USA is installing fibre to millions of homes each year despite the political power of the cable lobby.

Zero-friction competition on open fibre networks

An efficient fibre open access network usually offers a lot more real consumer choice and freedom than a copper network, even a well regulated one – and also arguably a great deal more than even than in a neighbourhood where copper competes with CATV.

Different countries organise their fibre eco-system in different ways but we can see an exemplar of consumer choice on the Swedish open networks. On our Swedish networks a customer can change their supplier of broadband, TV or phone easily online with the service being cut-over in less than 20 milliseconds. Compare that lightning fast process to the complexities of changing service provider in the UK today. At a recent INCA meeting one service provider (Communications Provider in Ofcom jargon) complained that 30% of orders submitted to BT Openreach fail first time around and, even if eventually accepted, will take days or sometimes weeks to be fulfilled.

Zero friction choice realised in 20 milliseconds on open fibre or weeks of uncertainty and pain with the BT/Ofcom system – it is surely clear which offers a real choice to the customer.

A fibre switchover is the only common-sense policy goal

If you have read this far you will understand why I think the only policy goal that makes any sense is a fibre switch-over. To stay on copper reduces our competitiveness and forces our citizens and businesses to pay more than they otherwise would and for inferior services. Why should the UK as a one of the world's leading economies have only sub-standard fixed broadband reliant on a costly dog's breakfast of increasingly complex and fragile electronics stretching out the life of an already obsolete infrastructure that the customer has already paid to replace?

If the logic of a fibre switchover is accepted, then one of the more difficult questions becomes how to finance fibre in the uneconomic areas which are mostly rural areas although I am sure some deprived areas in the cities would also prove difficult. Personally I favour a 100% goal but the challenge of modernising USO could potentially cause long delays. The New Zealand approach is an interesting case – they are aiming for a 75% switchover doing the lower cost areas first. This will give them a supply chain operating at scale and a clear understanding of the true deployment costs, both of which will greatly inform decisions on how to fund extension into the uneconomic areas.

Modernising the policy and regulatory framework

My view is that the current framework was built on the decision early on to favour infrastructure competition over services competition when a more balanced stance might have been better. It also, understandably, did not anticipate the challenge of taking a new form of wireline infrastructure into uneconomic areas – a challenge we last faced in Europe in the 1930s. Furthermore, a rather academic approach has led to the customer being charged for timely asset replacement through regulated tariffs and yet simply not getting the new local loop they have paid for. There are plenty of plain English terms for this sort of thing but to be polite I refer to it as the "replacement anomaly".

In order to attract private finance I believe that the UK should move towards a more contractual style of regulation. The New Zealand UFB initiative has in effect made such a shift although I cannot at this point say whether precisely that strategy would be the best for the UK. By a more contractual style, I mean that a number of operators (some regulated) deliver timely modernisation under fair terms in a transparent manner. To encourage private investment there needs to be a form of contract giving long term stability.

Regulatory Definition of Access Markets Would be better if Geographically Specific

One example of where current regulation falls down is the practice of treating general fixed access as a national market when it patently is not. There have been slight variations for leased lines in London and LLU exchanges but these evolved ad hoc and looking ahead investors will need to know how the system will adapt when new operators or Virgin Media come to have significant market power in a certain town or postcode. If a local fibre network takes 80% share will be regulated? On what terms?

European Framework Also Needs Reform

If we want to make a policy pivot of course a major obstacle could come from Europe. There is a preference already for open access and it was Europe that drove copper unbundling of course but the framework does not properly break out access infrastructure and the definition of universal service is no longer useful. Working across so many Member States inevitably slows down the process of change so the UK must in my view start lobbying for significant reforms ASAP.

Other Reforms to Consider

There are a number of areas where the current regulatory system is no longer fit for purpose that come to mind, although I am quite sure that this is not an exhaustive list:

- BT has responded to local broadband projects in the past with sudden local investment. This is very effective in deterring new competing investment posing a great risk to independent projects. Under a contractual approach BT would ideally commit significant specific and binding FTTP investment commitments using the money customers are already paying for modernisation. BT should commit to specific areas in clearly defined time windows leaving space and certainty for new alternatives to raise money and add capacity to the fibre switchover ecosystem.
- The replacement anomaly would be dealt with prompting major investment in FTTH at no cost to the taxpayer and with no increase in bills. Eventually once the switch-over is complete, then as in regulation of other utilities, a proportionate replacement reserve should be required so this problem does not recur in future.
- An obsession with infrastructure duplication combined with an inappropriate out-dated universal service definition has left rural areas (and certain other low return or uneconomic areas) at a huge infrastructure disadvantage. Universal service needs to be updated and modernised. In the past Ofcom analysed the cost of universal service down to zero in order avoid the embarrassment of small new competitors paying BT for the legacy rural and inner city networks it struggled to operate efficiently. This was understandable at the time but now poses a problem as we face an issue last faced in the 1930s – of extending a wireline network into uneconomic areas. In the 1930s the solution was of course cross-subsidy within a State monopoly but no-one would be in favour of this today (except perhaps the previous Australian Government). We need to modernise the definition and application of USO to be consistent with a fibre switchover:
    - USO should probably be defined in terms of availability of an open fibre local loop infrastructure rather than any specific service or application
    - Major access operators, including Virgin Media, should make a fair contribution.
    - Flow of funds should become explicit and based on the real costs of new networks today rather than some complex and opaque analysis of BT's accounts.
    - Obviously such funds should no longer flow to copper networks but instead provide guaranteed revenue streams helping make fibre projects in uneconomic areas bankable.

- Across the EU there is widespread but mistaken received wisdom that fibre access is a “technology” when in fact it is real estate. When combined with the admirable credo of *technological neutrality* this misclassification causes real problems in telecom policy. Technological neutrality makes perfect sense for services and electronics where asset lives are relatively short and changes unpredictable. It makes no sense at all if applied to the underlying real estate where asset lives are 40-90 years.

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Responses to Your Specific Questions

1. Views are sought on:

a) Is this an appropriate role for Government?

Yes. Government takes a role in other capital intensive yet vital-for-the-country infrastructures like rail, electricity, water etc. This is because market forces simply cannot work unaided in such industries which have natural monopoly characteristics, very high barriers to entry and long asset lives. This is also true of wireline passive infrastructure especially in rural areas. In such industries rules and contractual arrangements are needed to protect the interests of the consumer and inevitably Government must act ensure adequate investment, fitness for purpose (market forces being absent) and also ideally to enable some diversity in supply and innovation at the margins in order to challenge received wisdoms and practices.

The great majority of our citizens actively engage with broadband (as opposed to passively consuming electricity etc.) and rely on broadband at home, school and work for several hours each day. The economic potential impact of the Internet is not yet fully realised and is generally recognised by most as most likely huge.

My view is that it is entirely appropriate for Government to examine and if necessary also act to ensure there is the effective and efficient supply of a modern fit for purpose broadband infrastructure throughout the country. The UK does not have such a modern infrastructure at present (except in a few very small pockets) whereas many other countries increasingly do. It is time for us to starting catching-up.

b) What other high level principles might the Government adopt?

These are discussed in my introduction but I suppose key in my view are:

- Commit to a national fibre switch-over to provide clarity, clear direction and stability for investors not only in BT & Virgin but also in the new infrastructure builders/owners that we need to make the switchover efficiently and without undue delay;
- Move to a more contractual style of regulation with reasonable but geographically explicit binding obligations for investment and asset renewal by BT with the regulatory system also providing predictable long term pricing and stability for a range of investors;
- Modernise the concept and practice of universal service to deliver FTTP in uneconomic areas defined by availability of open infrastructure at a fair price rather than a particular service or application. There should be no more subsidies or grants for copper networks – all resources should be directed to the long term useful new infrastructure;
- Require rolling explicit geographic FTTP commitments from BT in order to provide stability and predictably enabling others to also invest. Long ago the UK issued 140 cable TV franchises and more recently New Zealand divided itself into 31 areas for UFB – both are examples of the type of process we need to provide stability and predictability.

c) What resources do you consider the Government should aim to deploy to effectively manage its role?

I suggest a handful of regional fibre development corporations which a combined budget over time of around £3 billion. Combined with the other measures I advocate (crucially those applied to BT) I believe this would result in investment of up to £20 billion over 10-15 years and additional tax receipts just on civil works of £5 billion meaning a net gain rather than cost to the taxpayer.

2. What potential opportunities are there for Government to leverage its combined buying power to support policy objectives?

There are good examples of local councils acting as anchor tenants in Peterborough, York and so on. This is a very useful and laudable means of stimulating local infrastructure improvements but I do not see it as a major factor in achieving the fibre switchover. Experience in several countries suggest that well-meaning attempts to manage procurements rarely work being rapidly overwhelmed by organisational complexity. It would perhaps be helpful for Government to require a long term TCO process to examine the case for dark fibre or participation in local schemes widening the base of open fibre – such schemes have the potential to lower Government's own costs.

3. If migration to IPV6 is required, are there any barriers to that migration and if so how might these be addressed?

The wording of this question is a little odd – Internet governance did not create IPV6 for its own amusement but because IPV4 addresses are all but exhausted. IPV6 is essential to provide address space for continuing growth and is vital for the Internet of Things etc. It is currently materially more expensive to deploy but my view is this is a somewhat detailed issue where industry should lead. Government and its agencies should:

- Ensure full support for IPV6 including mandating it as far as possible for Government systems;
- Remaining vigilant for anti-competitive practices and taking timely effective action if required.

4. Is an ongoing disparity of broadband services inevitable? If so, should this be addressed and how might this be done most effectively?

It will be physically impossible to modernise the whole country overnight so inevitably some disparity will continue for some years. As discussed in detail in my introduction, modernising and the concept and practice of USO based on true current construction and operations costs and ensuring all access providers contribute could be a very powerful mechanism for creating bankable projects in otherwise uneconomic areas.

5. How symmetrical will digital communications networks have to be in the future? Will this differ across user types? What implications does this have for fixed and wireless broadband provision?

Asymmetry is a technological accident deriving from limitations of copper and the design of xDSL. It is utterly pointless in active Ethernet networks and should gradually fall away over time. Most consumers tend to consume more data volume than they generate but the precise balance in future is unpredictable. It is not relevant anyway in the context of a fibre switchover – we need to junk xDSL and copper.

Wireless systems provide mobility and might complement wired access in some situations but can never on their own provide the kinds of capacity required. LTE, Wi-Fi and fibre will all co-exist and complement each other in different ways.

6. Which countries should be our benchmarks on communications infrastructure to ensure that businesses remain in the UK and continue to invest?

I think it is better to try and catch-up with the leaders and aim to provide our citizens with *more for less* rather than pick a set of arbitrary benchmarks. Such benchmarks are often manipulated over time to make specific points in favour of those resisting modernisation. If benchmarks must be chosen, then choose those who the leaders or seems set to become leaders in FTTP rather than the mediocre: Sweden, Netherlands, Singapore, and New Zealand.

7. What metrics do you think should or will become relevant in comparing network performance in different countries? Which metrics should most appropriately be used as the basis to set objectives for government policy?

Customers with FTTP generate 2-3x the traffic they did on xDSL. FTTP is also cheaper to operate. It's better and cheaper. Simple. Let's focus on moving the country forward.

Rather than waste time debating what latency or top speed a family of four might need in 2018 I think it would be more useful to accept the clear evidence that FTTP is better and cheaper and focus on trying to catch-up with the leaders. Protracted discussion of obscure details will only pander to the lobbyists resisting positive change.

8. Do you agree with this scenario or elements within it? Where do you agree/disagree? If you disagree what alternative scenario do you envisage?

Personally I do not find the scenarios useful because I believe they address the wrong question. The point of those scenarios, I assume, is to assess whether the country can make do for years to come with the dog's breakfast of increasingly complex and fragile electronics advocated by the copper lobby. I believe they ignore the crucial fact the FTTP is cheaper long term as well as offering completely future proof performance far ahead of copper.

A further problem is that the scenarios do not I believe account for the fact that migration to fibre results in 2-3x the traffic even from the same home setup and devices. The scenarios are described as exogenous to the issue of modernisation when in reality it's the opposite.

9. What are your views on the technology commentary underpinning this scenario? To what extent might the infrastructure/technology discussed evolve irrespective of demand and how far will it be a direct consequence of the level of demand?

See response to Q8.

10. Are there technologies not identified here that you think will have a major impact on the performance of existing infrastructure or the deployment of additional infrastructure in the next 10-15 years?

For the fixed access network, it is now clear from leading markets that active Ethernet (using point to point fibre between home and a suitably located node) is the way to go and we should just get on with it.

There may be a role for GPON in extremely low density areas but it would only be sensible for a very few percent of all UK premises. GPON is more expensive overall than AE, has limited capacity as the medium is shared and is also inherently insecure. It is favoured where the fibre owner wishes to reduce the regulatory risk of physical unbundling or there is widespread duct congestion.

11. Are there wider environmental issues not reflected in the scenario e.g. the price or availability of energy that will affect this scenario and in what way?

A fibre switchover will lower the carbon footprint of networks. We know from various operators that power consumption is significantly reduced with active Ethernet. Furthermore, as a fibre infrastructure is significantly more reliable there is also a carbon saving from fewer repair and maintenance journeys.

12. How likely is any unforeseen disruption to this scenario and what area might it occur?

See response to Q8.

13. Do you agree with this scenario or elements within it? Where do you agree/disagree? If you disagree, what alternative scenario do you envisage?

See response to Q8.

14. What are your views on the technology commentary underpinning this scenario? To what extent might the infrastructure/technology discussed evolve irrespective of demand and how far will it be a direct consequence of the level of demand?

My view is that there is only one common-sense goal for wired network policy and that is a fibre-switchover. FTTP will result in lower than otherwise bills for the customer. I agree that inevitably over time all countries will move to FTTP and you can see this already where certain highly localised as yet parts of Africa are ahead of the UK.

A fibre switchover will also facilitate enormous improvement in the coverage and performance of mobile and wireless networks if those operators choose to invest in the various innovations for smaller higher capacity wireless.

15. Are there technologies not identified here that you think will have a major impact on the performance of existing infrastructure or the deployment of additional infrastructure in the next 10-15 years?

All those fantastic developments will either rely on or be greatly enhanced by a national fibre switchover.

16. Are there wider environmental issues not reflected in the scenario e.g. the price or availability of energy that will affect this scenario and in what way?

A fibre switchover will lower the carbon footprint of networks. We know from various operators that power consumption overall is significantly reduced with active Ethernet. As a fibre infrastructure is significantly more reliable there is also a carbon saving from fewer repair and maintenance journeys.

17. How likely is any unforeseen disruption to this scenario and what area might it occur?

No comment.

18. Do you agree with this scenario or elements within it? Where do you agree/disagree? If you disagree, what alternative scenario do you envisage?

This scenario is the most relevant and believable for me notwithstanding my earlier remarks about the general approach taken with the scenarios. Fibre access (para 3.45) should be ubiquitous eventually and I also agree that the historical accident of asymmetry (stemming from xDSL) is unhelpful and unnecessary. Our Swedish operations have offered symmetric broadband at 100M or more for more than 10 years and we see other leading nations following that pattern. It would be great if the UK could catch-up.

19. What are your views on the technology commentary underpinning this scenario? To what extent might the infrastructure/technology discussed evolve irrespective of demand and how far it be a direct consequence of the level of demand?

There are many dynamic changes in the Internet above layer 2 and I am not sure it is useful at this point to try and predict them or the business models that may emerge. The UK's real problem is the lack of fibre deployment (layer 1) and the underperformance of wholesale at layer 2. These are the key strategic issues for the UK in my view.

20. Are there technologies not identified here that you think will have a major impact on the performance of existing infrastructure or the deployment of additional infrastructure in the next 10-15 years?

It is now clear from leading markets that active Ethernet (using point to point fibre between home and a suitably located node) is the way to go and we should just get on with it.

There may be a role for GPON in extremely low density areas but it would only be sensible for a very few percent of all UK premises. GPON is more expensive overall than AE, has limited capacity as the medium is shared and is also inherently insecure. It is favoured where the fibre owner wishes to reduce the regulatory risk of physical unbundling or there is widespread duct congestion.

21. Are there wider environmental issues not reflected in the scenario e.g. the price or availability of energy that will affect this scenario and in what way?

A fibre switchover will lower the carbon footprint of networks. We know from various operators that power consumption overall is significantly reduced with active Ethernet. As a fibre infrastructure is significantly more reliable there is also a carbon saving from fewer repair and maintenance journeys.

22. How likely is any unforeseen disruption to this scenario and what area might it occur?

No comment.

23. Are there factors, for example technical or unrelated to the regulatory framework, that could create bottlenecks and delay future infrastructure deployment in the UK in this timeframe, that would result in demand not being met or the UK not being seen as a leading digital nation?

I do not believe the decisions not to regulate active Ethernet prices (your para 4.6) or to get PIA working effectively (your para 4.) are wise. They seem on the surface to be decisions which are temporarily convenient and made without an overall policy goal of timely modernisation – specifically a fibre switchover. This is not a problem if our policy is to continue drifting into mediocrity of course. I fully accept that without a clear direction of

travel each such detailed issue is analysed only on the narrow facts and narrow lobbying rather than taking account of its potential role in the wider and more fundamental policy.

24. Do you expect commercial providers to deliver future infrastructure and meet demand on a purely commercial basis, or is some form of public intervention likely? If public intervention is likely how might that work with the commercial provision of infrastructure? What form might that intervention take?

In my view there seem to be three key things to get right (discussed in more detail in my introduction):

- Modernising the concept and practice of universal service. Properly costed on current real world new network construction and operations costs this is potentially a powerful mechanism, already embedded in UK and European regulation, for creating significant revenue streams which can be used to support bankable projects and financial instruments for a variety of providers, not just BT. Virgin Media and other significant access providers should make a fair contribution. No funding should be provided for the copper networks – they have been greatly over-recovered already.
- A new more contractual approach to regulation is required balancing short consumer interest with timely modernisation of infrastructure which is a longer term benefit. By its nature such an approach should also provide the long term stability necessary for significant private investment including but not limited to BT. An important part of this would also be to end the replacement anomaly whereby customers pay BT each month an amount for timely asset renewal in the local loop which is diverted elsewhere. Its common-sense surely that the public actually gets what it already pays for.
- To accelerate private investment I suggest:
    - Redefining and correctly calculating USO to relate only to fibre infrastructure and taking steps perhaps through BT's undertakings to have a more effective separation of infrastructure from the active wholesale layer for BT Openreach;
    - Perhaps create a handful of regional fibre development corporations with a combined budget over time of around £3 billion to develop and support bankable projects creating 5x-7x private leverage of public money.

Combined with the other measures I advocate in my introduction I believe these would result in investment of up to £20 billion over 10-15 years and additional tax receipts on civil works alone of £5 billion meaning a net gain rather than cost to the taxpayer.

25. Which current or draft legislation might prevent or facilitate the emergence of any of the scenarios?

I suggest that what is needed first is clarity in direction of travel and a fibre-switchover goal (such as the one set in New Zealand of 75% FTTP in a defined time). Without such a basic strategy there is no stable basis for legislation or regulatory practice and we will continue to

have what has been described as a *random walk* in policy and regulation. If you do not know where you are going, how can you decide which way to go?

In any such discussion the issue of structural separation of BT Openreach soon arises. My view is that this would be most helpful but is not necessarily essential. Also note that Telecom New Zealand shareholders gained between 20% and 37% (depending on how you measure it) from the separation of Chorus out of TCNZ. I suspect BT shareholders could make similar gains.

26. Do you have views on which scenario (or combination of scenarios) is most likely and should influence the development of future strategy?

I do not find the scenarios helpful. In the fixed network it seems clear to me at a high level what is needed and why it is needed:

- We need a clear direction in policy to modernise and make the fibre switchover, preferably with specific targets supported by a series of significant changes in regulatory practice and also some modest public investment in development corporations or other such vehicles enabling smart use of financial instruments;
- The fibre switchover will benefit the customer through lower than otherwise bills and dramatically improved and more reliable infrastructure which will in turn enhance national competiveness, quality of life and also create opportunities for innovation in technological, service and creative industries making use of the hugely more capable yet cheaper network.

27. How might efficient investment in communications infrastructure be supported, for example by changes in the regulatory framework?

My view is that the current framework was built on the initial decision to favour infrastructure competition over services competition. With the benefit of hindsight a more balanced stance and treating access as a utility might have been better. A rather academic approach has led to the customer being charged for timely asset replacement through regulated tariffs and yet simply not getting the new local loop they have paid for. There are plenty of plain English terms for this sort of thing but to be polite I refer to it as the “replacement anomaly”.

In order to attract private finance I believe that the UK should move towards a more contractual style of regulation. The New Zealand UFB initiative has in effect made such a shift although I cannot at this point say whether precisely that strategy would be the best for the UK. By a more contractual style, I mean that a number of operators (some regulated) deliver timely modernisation under fair terms in a transparent manner. To encourage private investment there needs to be a form of contract giving long term stability. One example of where current regulation falls down is the practice of treating general fixed access as a national market when it patently is not. There have been slight variations for leased lines in London and LLU exchanges but these evolved ad hoc and looking ahead investors will need to know how the system will adapt when new operators or Virgin Media come to have

significant market power in a certain town or postcode. If a local fibre network takes 80% share will it become regulated in future? On what terms?

There are a number of areas where the current regulatory system is no longer fit for purpose that come to mind, although I am quite sure that this is not an exhaustive list:

- BT has responded to local broadband projects in the past with sudden local investment. This is very effective in deterring new competing investment posing a great risk to independent projects. Under a contractual approach BT would ideally commit significant specific and binding FTTP investment commitments using the money customers are already paying for modernisation. BT should commit to specific areas in clearly defined time windows leaving space and certainty for new alternatives to raise money and add capacity to the fibre switchover ecosystem.
- The replacement anomaly would be dealt with prompting major investment in FTTH at no cost to the taxpayer and with no increase in bills. Eventually once the switch-over is complete, then as in regulation of other utilities, a proportionate replacement reserve should be required so this problem does not recur in future.
- An obsession with infrastructure duplication combined with an inappropriate out-dated universal service definition has left rural areas (and certain other low return or uneconomic areas) at a huge infrastructure disadvantage. Universal service needs to be updated and modernised. In the past Ofcom analysed the cost of universal service down to zero in order avoid the embarrassment of small new competitors paying BT for the legacy rural and inner city networks it struggled to operate efficiently. This was understandable at the time but now poses a problem as we face an issue last faced in the 1930s – of extending a wireline network into uneconomic areas. In the 1930s the solution was of course cross-subsidy within a State monopoly but no-one would be in favour of this today (except perhaps the previous Australian Government). We need to modernise the definition and application of USO to be consistent with a fibre switchover. Major access operators, including Virgin Media, should make a fair contribution. Flow of funds should become explicit and based on the real costs of new networks today rather than some complex and opaque analysis of BT's accounts. Such funds should, clearly, no longer flow to copper networks but instead provide guaranteed revenue streams helping make fibre projects in uneconomic areas bankable.
- Across the EU there is widespread but mistaken received wisdom that fibre access is a "technology" when in fact it is real estate. When combined with the admirable credo of *technological neutrality* this misclassification causes real problems in telecom policy. Technological neutrality makes perfect sense for services and electronics where asset lives are relatively short and changes unpredictable. It makes no sense applied to the fundamental real estate where asset lives are 30-90 years.

28. Are any further regulatory measures necessary to incentivise the rollout of future mobile infrastructure in currently underserved areas?

My focus is on fibre which I believe to be the key issue. It is clear that more widespread open access fibre would greatly improve backhaul and so enable all sorts of new technological methods of mobile coverage and local capacity.

29. Is there a role for a revised USO or USC to ensure that minimum consumer demand requirements are met and to reduce the potential for a new digital divide? What might this look like?

This is a crucial issue in my view. I suggest USO is modernised being defined as provision of effectively open access fibre (layer 1) and open ports (layer 2) to the boundary of each premise in the country. The market will take care of the rest including what is an acceptable basic minimum service. There is no longer a need to tie USO to voice when we have near ubiquitous mobile coverage and the trend around the world is to dump the fixed line.

In the past Ofcom analysed the cost of universal service down to zero in order avoid the embarrassment of small new competitors paying BT for the legacy rural and inner city networks it struggled to operate efficiently. This was understandable at the time but now poses a problem as we face an issue last faced in the 1930s – of extending a wireline network into uneconomic areas. In the 1930s the solution was of course cross-subsidy within a State monopoly but no-one would be in favour of this today (except perhaps the previous Australian Government). We therefore need to modernise the definition and application of USO to be consistent with a fibre switchover. Major access operators, including Virgin Media, should directly make a fair contribution. Flow of funds should become explicit and based on the real costs of new networks today rather than some complex and opaque analysis of BT's accounts. Such funds should, clearly, no longer flow to copper networks but instead provide guaranteed revenue streams helping make fibre projects in uneconomic areas bankable.

The UK should also lobby and push the modernisation agenda in Europe to influence and adopt EU regulation to a more useful modern form for USO, unbundling of fibre, recognition of CATV market dominance in certain geographic areas etc.

30. In terms of supporting future innovation and long-term investment in infrastructure, what areas of broadcasting regulation may have served its purpose by 2025 -2030 (or indeed earlier)? What future technical developments may also have longer term implications for regulation and wider public policy?

No comment.

31. Are there changes to the EU Regulatory Framework that the UK might seek to encourage more competition in UK markets?

We should encourage a change to a more contractual style of regulation as discussed in my introduction. In privatised water and electricity private ownership and adequate investment

guided by the regulator have been much better reconciled than by Ofcom in wireline. This is an issue for wireline networks akin to water and electricity and not so much for spectrum or other parts of Ofcom's remit. There is a case therefore for splitting out the regulation of long asset life utility like infrastructure out of Ofcom to a new specialised regulatory body. Such an advance of course may need changes in the EU framework which similarly mixes more ephemeral services with long life infrastructure.

Regulation should focus on open access to networks and I believe the approach I have set out could extend infrastructure competition significantly by means of USO funds and fibre development corporations. A key aspect of such a new framework would be binding geographically specific commitments (and hence also limitations on expansion in a defined period) by incumbents providing space and stability for new alternatives to develop in some areas under fair, transparent and long term stable regulatory settlements.

32. Should Government seek changes to the European regulatory framework which put more reliance on competition law and how might this be done?

See response to Q31.

33. In what ways can you see competition driving technological change in the UK in the future?

A huge improvement in competition in fixed would come with the structural separation of BT Openreach into separate passive and active operators. The next best thing would be a more contractual approach to regulation creating stability and space to encourage private investment in new local fibre networks. In privatised water and electricity private ownership and adequate investment guided by the regulator have been much better reconciled than by Ofcom. This is an issue for wireline networks akin to water and electricity and not so much for spectrum or other parts of Ofcom's remit. There is a case therefore for splitting out the regulation of long asset life utility like infrastructure out of Ofcom to a new specialised regulatory body.

Technological change in services above layer 2 can be left to the market – I think policy should focus on the fundamental infrastructure for the next decade.

34. How can the regulatory framework keep up to date with new business models and changes in technology?

Networking sharing is positive for the customer in my view, provided it is well regulated ensuring efficient open access at different layers. In a number of other countries the regulated incumbent makes dark fibre available at a reasonable price without the world coming to an end and this is perhaps an obvious if controversial measure for BT and any new fibre operators gaining local market power.

35. Are there any changes to legislation other than the Communications Act 2003 that would incentivise the provision of communications infrastructure?

There are a number of good points raised including reference to business rates. Regarding 4.34, on the open access fibre networks we managed in Sweden customers can swap service provider online and be cut-over in less than 20 milliseconds. This is how it should be in the UK.

36. Would there be benefits to investment from a focus on broadband only services? Are there any barriers to the emergence and adoption of broadband only services, whilst still providing necessary access to emergency services?

It is clear that universal service type obligation for voice are antiquated and moving the focus to broadband only would be a step in the right direction. However I think it would be better to focus on universal open access to fibre at both layer 1 and layer 2 and let the market take care of the rest.

37. How might copper access networks evolve over time alongside other access technologies? Is there a role for policymakers in helping manage any transition from copper to other access networks?

This is the key £20 billion question. As explained in my introduction open access FTTP is not only cheaper than staying on copper but also makes the Internet twice as useful as well as opening up numerous opportunities for productivity gains and innovation, not least in the creative industries. We are already well behind many competitor nations and should start catching-up. There is a key role for policymakers as discussed at length in my introduction.

38. Views are sought on whether there are any additional actions the Government should consider to ensure:

a) That the provision of all areas of the UK's digital communications infrastructure remains competitive in order to ensure that the UK can take full advantage of growth opportunities in the Digital Age;

b) Aside from legislation and adapting the regulatory framework in the broad sense which other actions should the Government take to encourage investment in communications infrastructure?

c) That potential investment in the provision of digital communications infrastructure offers a suitable risk and reward profile to ensure that they can be financed by the private sector.

Please see the section "Modernising the policy and regulatory framework" in my introduction and also my responses to Q27 & Q29.

39. Views are sought on:

a) The case for the UK to invest to gain 'early mover advantage';

b) In what areas in particular the UK should aim to see investment;

c) Are there any actions not covered elsewhere in this report that the government should consider to ensure digital communications infrastructure is in place before it is needed and such that it helps generate need.

In terms of fibre access we are already laggard rather than early mover! There is a list of examples on the first page of this response.

Please see my introduction for discussion of b) and c).

40. How can we maximise the current R&D and innovation UK landscape to help take advantage of the opportunities provided by future technologies? What needs to be done by Government and its agencies, and industry to tackle any gaps?

Innovation rarely happens in isolation. For our creative industries – particularly gaming and video entertainment – if we had extensive all fire symmetric broadband it could only be positive for innovation in these sectors especially. Sweden fibered its towns and cities early and created Skype, Spotify and yes also the Pirate Bay. We do not know what is coming next in virtual reality and so on but it is certain that if the people engaged in relevant industries here are not living with the new fibre infrastructure then innovation will tend to happen abroad where that infrastructure is already mass market and becoming pervasive, embedded in daily life.

41. In which future communications technologies do you consider the UK has, or could achieve, an international leadership position?

My chief concern is our poor performance in wireline and FTTP in particular. I think catching-up should be the focus of policy as it will bring lower bills and greatly improved services to all.

42. What more could government and industry do to exploit future technologies, associated new applications and emerging business models?

See response to Q40. The relevant technologies may relate to comms rather than be of comms.

43. What role might local bodies in have facilitating the future delivery of digital communications infrastructure?

Earlier in my responses I suggested the creation of a handful of regional fibre development corporations to stimulate much greater private sector investment.

44. How can councils maximise the digital communications infrastructure in their local area to support their work on economic regeneration?

I believe there are two main models:

a) Reduce own long term costs by doing an anchor tenant deal with a new dark fibre provider like City Fibre Holdings to encourage availability of open reasonably priced fibre around their area;
b) Work as an impact investor making targeted 20 year low interest loans to help develop local district fibre schemes – these would of course leverage any open fibre stimulated by a) above.

End of document

[i] See my 2012 report for the FTTH Council for an explanation. URL in the introduction.
[ii] Source OECD - http://www.oecd-ilibrary.org/taxation/total-tax-revenue_20758510-table2