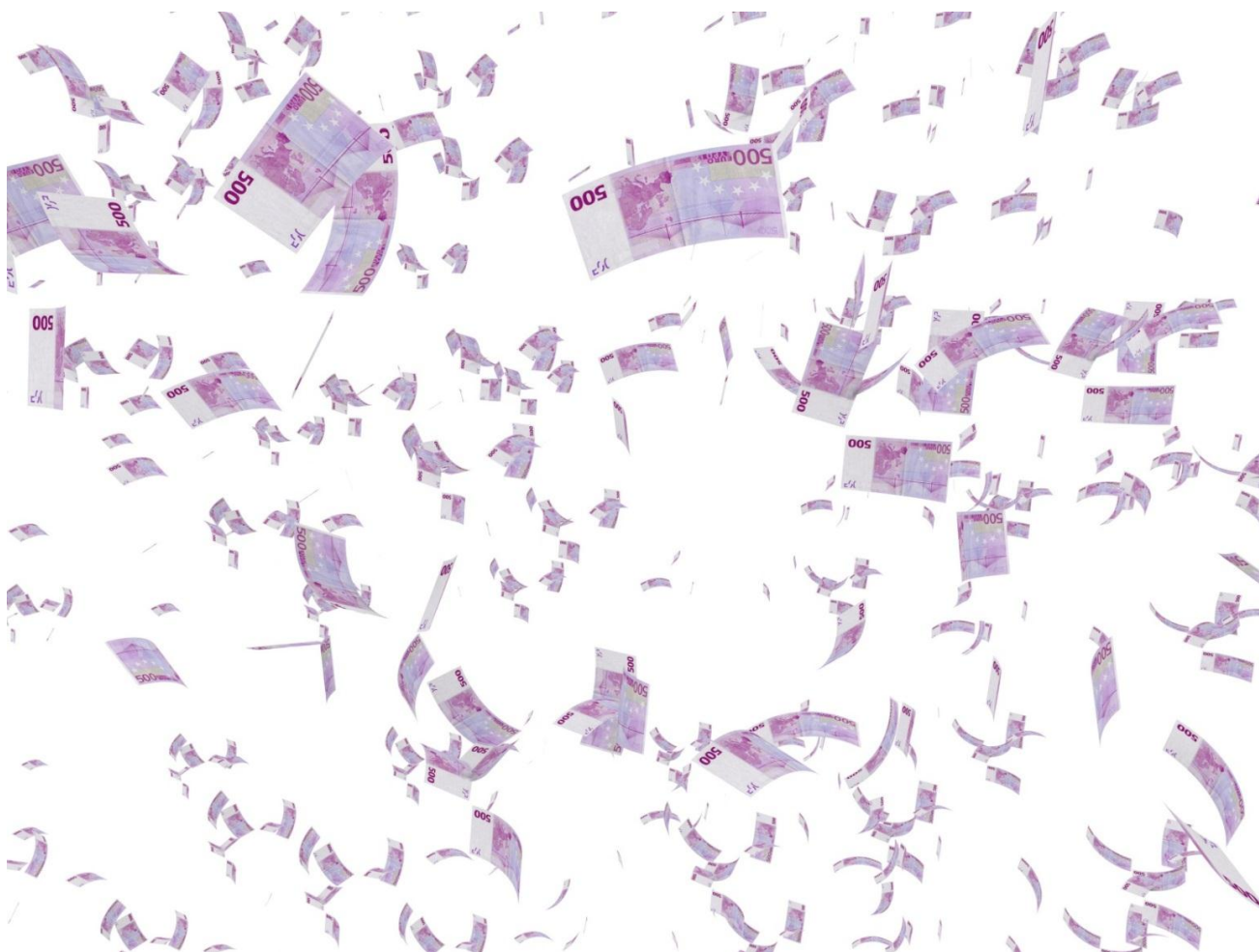


Financing Stimulus for FTTH

Funding Europe's €260 billion access fibre upgrade:
A rationale and specific recommendations for a new
approach by industry, policy makers and governments



Disclaimer

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0 Executive Summary

It is widely accepted that, in the long term, traditional copper pair connections to homes and businesses will be replaced by fibre. Larger businesses have had such fibre connections for some years already. Such fibre local loops have a lower total life cost and offer much more potential bandwidth for the customer. In short, fibre is cheaper and better than copper. So why is there no rush towards what we call the *Fibre Switchover*?

A very limited number of operators worldwide are already making this type of switchover but it seems to us that a combination of financial constraints and anomalous regulatory custom and practice are hindering more rapid progress in Europe.

To take fibre into every home in the EU27 - excluding the 40% in urban areas that we assume will take cable broadband – will cost an estimated €272 billion. We believe ~€11 billion has already been invested so the investment still required is €261 billion. The industry invests roughly €20 billion per annum in fixed networks but on average over the last four has invested less than €3 billion p.a. of that in fibre. At that rate, it will take 92 years to achieve the Fibre Switchover.

The industry could fund the switchover itself over a period of ~25 years and through tariff regulation customers are already paying for this to happen at that rate. We call this the *social contract for timely renewal* of assets. Established regulatory practice however ignores this social contract. Unless there is clear threat from an infrastructure competitor there is no reason to invest in fibre as the cash will keep flowing from copper anyway. There is no business case that beats such “free money”. The cost reductions from fibre will only fully materialise at the end of the switchover (and are uncertain in magnitude) so faced with the large initial investment needed, it is quite rational for an incumbent to minimise fibre investment.

In spite of the financial crisis, there is no fundamental shortage of capital even for a faster switchover. We have interviewed numerous financiers, funds and banks who confirm this. If the industry goes to the markets in the right way then there is plenty of capital. We have met funds that are almost desperate to find fibre projects with the right structure and risk profile.

The root of the problem therefore is one of misaligned incentives and timing. To accomplish the Fibre Switchover in roughly 25 years a change in regulatory approach is necessary. To achieve the Switchover in *less* than 25 years both a change in regulation and also some financial intervention by Governments will be required. That intervention will need to focus on the less densely populated areas (the grey and white areas in State Aid jargon). Historically, wired networks were pushed out into such high cost areas by political will driving cross-subsidy within State owned monopolies. Those days are over and mobile also offers a partial substitute for fixed networks making the economics of the latter more difficult (although the latest mobile networks also need extensive fibre to be available).

In contrast to the approach to digital television, so far there has been no coordinated plan or programme to drive the Fibre Switchover. In fact, there seems to be a consensus that in the absence of a clear direction Governments and regulators tend to be reactive to short term lobbying. This leads to what one economist described as a “random walk” – meaning a series of random steps without connection to each other. Such behaviour is anathema to long-term investors - whether they are an operator or an infrastructure fund – which are needed to finance the Fibre Switchover.

A Fibre Switchover for the EU27 is realistic and entirely possible if the political will exists to drive it forward. There is plenty of evidence to suggest that a Fibre Switchover would generate jobs and growth to repay the

investment. It's an ideal form of stimulus investment because the spending and benefit is quite literally spread out to *every* home and business, not just concentrated in a few lucky areas.

The faster we want to progress, the greater the taxpayers' financial support will have to be but if built over 25 years then no taxpayer money would be needed. In order to achieve the Fibre Switchover we recommend a seven-point action plan as follows:

- 1) **Modify the regulatory approach** to the local loop putting long-term contractual relationships to the fore and thereby creating public, operator and investor confidence in a stable, transparent and predictable regulatory environment. Commitments to delivery by operators should be public, reinforced by performance guarantees, and non-delivery should be penalised with appropriate penalties and/or cash clawbacks;
- 2) **Enforce the existing social contract for replacement** so customers get the modern infrastructure that they are already paying for;
- 3) **Change the economics of grey and white areas** using targeted transfers or interventions so that PPPs and similar project financing approaches stimulate renewal of the natural monopoly access network;
- 4) **Use strategic pricing** to ensure that regulated wholesale prices for copper access reflect its long term higher costs and charge a sufficient premium to drive technological migration in retail markets. Additional cashflows generated by such strategic copper prices should be directly used to help fund the Fibre Switchover;
- 5) **Update the concept and mechanisms of universal service** to fully support the Fibre Switchover in the grey/white areas. Greater symmetry in fixed market regulation of black areas should ensure that Cable TV operators make a fair contribution in any Member States where they do not already do so;
- 6) **Smarter interventions** by Government and EU Authorities to both emphasise stimulus rather than subsidy (thereby also reducing total life costs of intervention to the taxpayer) and the establishment of Fibre Development Corporations to act as impact investors - creating a pipeline of bankable deals and a financing ecosystem to accelerate the Fibre Switchover;
- 7) **Provide active support for community self-provision** in those areas where this will either deliver faster modernisation or significantly reduce whole-life costs to other customers and taxpayers.

We believe that if these measures are adopted with all relevant parts of Government and industry pulling together, then we can make greater and faster progress to a lower cost higher output infrastructure than any other major trading block in the world.

1 Introduction, EU27 Fibre Investment and Operator Finances

The task assigned to us by the Fibre to the Home Council Europe in early 2012 was defined as follows:

“Define scenarios for, and evaluate the impact of, fibre stimulus packages and financing tools”.

This turned out to be much more challenging than we first realised. During this study we have identified new financing tools but the implicit assumption in the question was that these would then be likely to be used in practice. In considering why they might now be adopted (when so far they have largely been ignored), we realised that more thought was required rather than simply providing a description of potential financing mechanisms.

In the course of this study, we have spoken to many executives and experts including operators, banks, infrastructure funds, government officials and numerous analysts and other industry participants. It is striking that there is no common understanding of the backdrop to Europe’s investment in access fibre and no consensus regarding the way forward, even though the debate is current and active.

1.1 The Benefits of a Complete Fibre Switchover v Long Term “Co-existence”

Discussion of fibre or ultrafast broadband is often centred on the question of whether customers need 100Mbit/s or not and if they do, whether it is *worth* the cost of providing them with such speeds. In our view, it is obvious that in markets where ultrafast is readily available, customers do choose faster networks but the question essentially misses half of the point. The whole life cost of a fibre network is lower than for copper. That means that in terms of economic productivity a fibre access network delivers not just more but delivers it at a total lower cost.

Not only is the fibre cable and active equipment cheaper but, more importantly, on-going operating costs are significantly lower than for copper. Total operational cost reductions of 15%-30% are widely accepted as possible by CTOs in private conversations discussing the potential benefits of fibre. However, the majority of such opex savings in a network are only realised when there has been a complete switch from copper to fibre and the last copper has been de-commissioned. Running two parallel technologies – both of which therefore would have lower utilisation factors than if there were a single type – is a recipe for high costs through enduring complexity in other systems, customer service and so on.

Comparing like for like, fibre access networks are lower cost to build than copper and much lower cost to operate. They also have the potential to deliver significantly more in terms of services. Such modernisation would provide a major productivity gain in broadband to the benefit of operators, customers and the wider economy.

In our view the Digital Agenda Europe (DAE) 2020 goal and policy logic both suggest that passing all homes with fibre is the only sensible goal – in the long term. It is a matter of conjecture whether leaving the final drop for a proportion of the customer base on copper for another 20, 30 or 40 years would be worthwhile. It may be that most of the productivity and service benefits could arise while a significant minority of homes remain on copper below the distribution point but for the sake of both clarity and simplicity, we advocate policy driven by a complete replacement of copper by fibre. We refer to this complete changeover as the *“Fibre Switchover”*.

Fibre deployment has the potential to generate a financial return for an operator, but modernisation should also bring wider economic benefits. One estimate was recently produced by Italian economists¹ and is shown below. The economic benefits are significant particularly when set against the traditional size of the fixed telecom sector (roughly 2% of GDP).

Type of Effect	Magnitude	Remarks
GDP Growth		
Direct	+1.1%	Direct effects are a result of investment in a fiber access network. Indirect effects are the capacity of the economy to promote innovation, offering new services and enabling substantial economic development
Indirect	+3.5%	
Employment Growth	+1.1%	Overall job creation
Public Welfare (as measured by HDI)	+14%	The United Nations Development Program Human Development Index (HDI) takes into consideration network effects on welfare key indicators

Source: Cisco IBSG and University of Rome II Tor Vergata, 2011.

Figure 1 University of Rome Estimate of Wider Economic Impact of a Fibre Switchover – Each 1% of EU27 GDP is roughly €120 billion per annum

Putting this in context, the GDP improvement suggested by that study would generate economic benefits equivalent to the cost of a complete fibre switchover in less than three years.

In this report, we present both our analysis of the financial feasibility of, and our recommendations for, stimulating a Fibre Switchover. If implemented the programme would be financially feasible but highly ambitious and would require significant changes in approach by many both in the industry and in Government Authorities.

We make no apologies for being ambitious in the scope of our recommendations. The current regime is not delivering timely modernisation of the local loop and as Einstein reportedly said:

"Insanity is doing the same thing, over and over again, but expecting different results."

¹ <http://www.cisco.com/web/about/ac79/docs/ps/UBB-in-Developed-Countries.pdf>

1.2 The €260 billion Challenge of Replacing Copper

EU Governments agreed the Digital Agenda Europe in 2009. Numerous targets were set and progress towards each is shown on the KPI infographic produced and regularly updated by DG Info Soc.

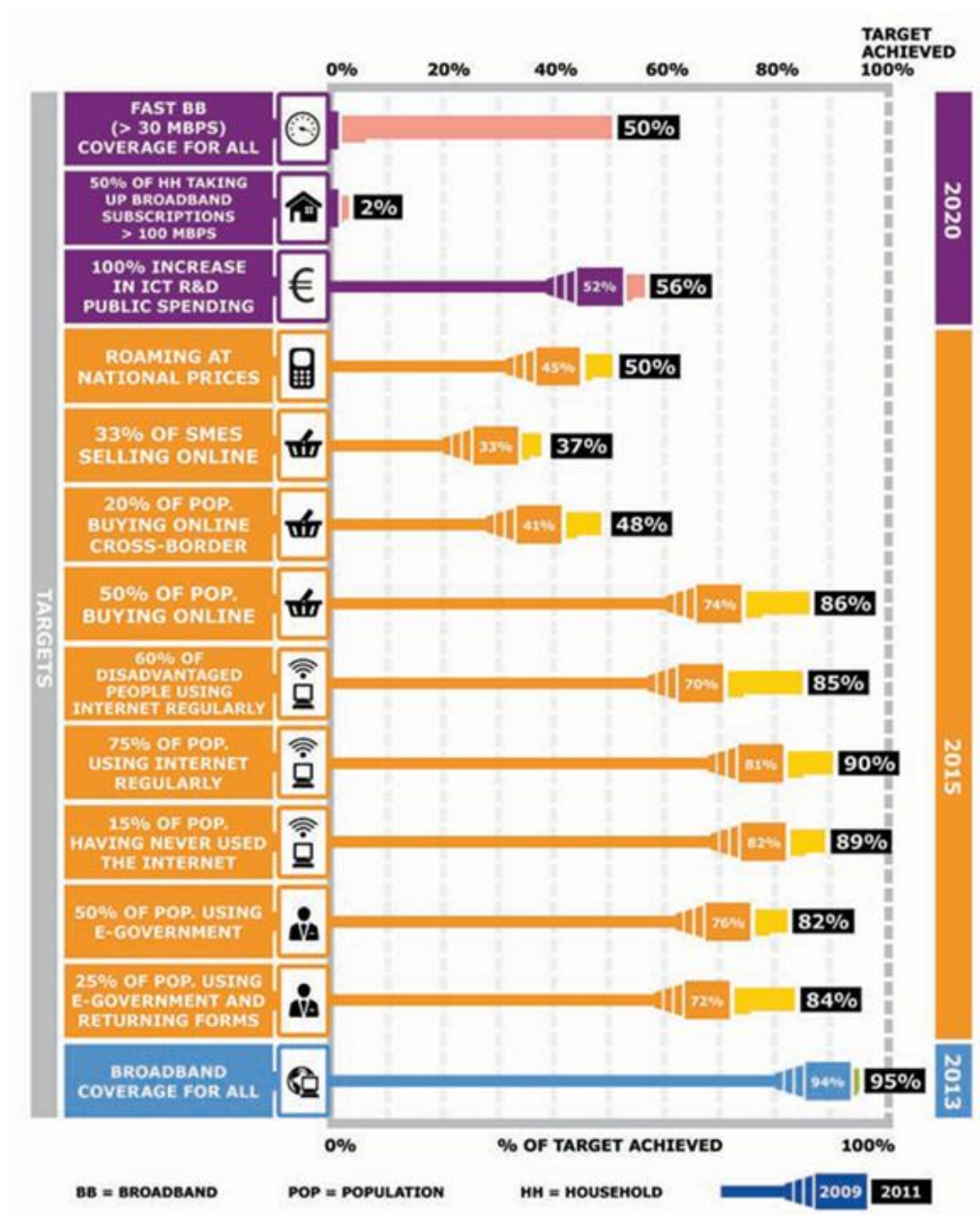


Figure 2 Digital Agenda Europe (DAE) KPIs. Source DAE Scoreboard

Of the various goals, the second is the one that concerns this study. The goal of 50% of European homes subscribing to 100Mbit/s or faster broadband by end 2020 implies major investment as these services are not available to anything like the target percentage, let alone actually taken up as subscriptions. As is clear from the graphic, overall progress so far is negligible.

Based on our research, interviews and our own experience running a fibre operator in Sweden, it is clear to us that 100 Mbit/s is becoming the new basic access speed where ultrafast networks are commonplace.

From that point of view, the goal is sensible in terms of the end-point although reaching that level of adoption right across the EU27 by end 2020 now seems optimistic.

In recent years, the industry has been passing more homes per month than simple background replacement would imply but the rate at which new fibre connections are taken in to the home (see the yellow gauges below) is far below the rate needed to meet the DAE 2020 goal².

The DAE target implies a need for around 1.1 million new 100Mbit/s connections each month from January 2013 and implies a need to pass another 1.6 million per month.³ By examining the progress reported in the FTTH Council's Panorama we can compare progress over the last three years compared to these rates – less than 0.1 million per month are being connected with fibre.

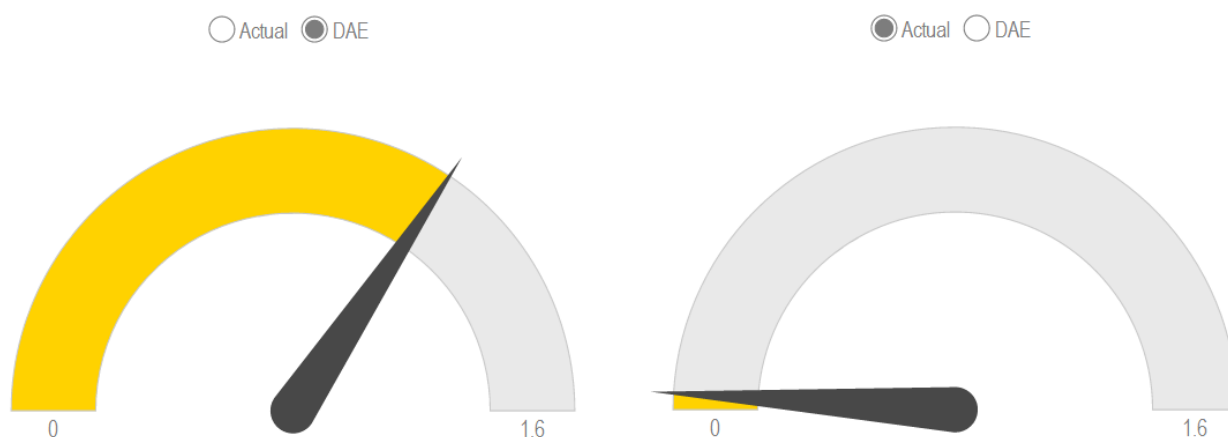


Figure 3 Millions of Homes Per Month to be Connected at 100Mbit/s – DAE 2020 Target v 3 Yr Actual

Note: The calculations assume that 40% of homes in urban areas will be served by cable TV networks.

In order to estimate the cost of this modernisation – and the financing needed - we need to take into account both the basic cost driver of customer density and the capital investment already made in fibre deployment. Regarding the first factor, it is well known that the economics of a wired network vary with the geographic density of customers:

- The lowest cost to serve will be where people live in large apartment blocks (particularly areas where many such blocks are crowded together). The construction cost per home in such areas is low because only a couple of route metres, or less, are required per home passed.
- At the opposite end of the spectrum are isolated homes or farms with very long local loops where much of the route length is shared with only a few customers at best. One incumbent told us of a remote farm (admittedly an extreme case) where they had calculated that the replacement of the loop with fibre – to replace copper stolen by metal thieves – would have a payback of almost 500 years.

² We focus on fibre in this report and are taking the DAE goal to imply needing fibre or an upgraded cable TV network although FTTC may well support such speeds in some areas as we discuss later in the body of the report.

³ Note: The figure for homes to be passed is not simply twice the figure to be connected as the 50% of homes ratio might imply because we have taken account of homes already passed and connected.

The pattern of competing network deployments and fibre upgrades generally reflects these economic characteristics. Around 45%⁴ of EU homes have both cable and telco infrastructure and in a few places, up to four physically independent networks compete for each home. In rural areas however, with very rare exceptions, there is a de facto natural monopoly of telecom access. These characteristics led the EU to define three types of geographic area in the State Aid guidelines:

Black	Grey	White
<ul style="list-style-type: none"> • Two or more NGA networks either in place or being deployed in the next three years 	<ul style="list-style-type: none"> • Only one NGA network is in place or being deployed in the next three years • No prospect of another NGA network being deployed in the same area in the next three years 	<ul style="list-style-type: none"> • Regions where no NGA networks exist • NGA unlikely to be developed in the near future (taken to mean three years)

Figure 4 State Aid Black, Grey and White Area Definitions

In our analysis and this report, we distinguish between the black areas and the grey/white. A distinction between grey and white would require us to know what may or may not happen across these areas over the next three years. For our purposes, we assume that past investment has correctly indicated that these areas are likely to be natural monopolies for access infrastructure and a policy encouraging a Fibre Switchover should take that into account.

Earlier this year the FTTH Council Europe completed a study of the likely maximum capital investment required to modernise the EU27 access network by building to address the DAE target of 30Mbps for all and 50% of households subscribing to 100Mbps. This method assumes:

- a complete overbuild of all existing infrastructure – including any existing qualifying NGA infrastructure;
- that all wiring is underground;
- no cost savings from innovative installation techniques or re-use of ducts or sharing of other existing utility assets although significant savings are possible.

For the purposes of this work we have adjusted the basic (€202 billion) model to include additional items as defined in the table below. The result is the CAPEX case used throughout this report.

⁴ Source: FTTH Council Europe Regulatory Committee

	Total €billion	Black Areas	Grey & White Areas
FTTH Council Europe GIS model based on 50% switchover to match DAE 2020 Goal	202	62	140
Additional investment for 100% switchover excluding 40% CATV in black areas	+70	+7	+62
5% non-home premises passed by above investment - assume pay own connections	-	-	-
Total	272	69	202
Prior years fibre CAPEX	-11	-10	-1
Remaining Investment for Switchover	261	60	201

Figure 5 FTTH Council Estimated CAPEX Adjusted to Represent 100% Switchover of Telco Customers. (Each Figure Rounded to Nearest Billion)

In the next section we look at the revenues and cashflow of the fixed operators to see how this level of investment might be funded.

1.3 EU27 Telco Revenues and Cashflows

According to the EU, total revenues for the sector in 2010 were €327 billion and for fixed services were €145 billion. The total for fixed includes telephone, broadband and data service revenues but excludes revenues from broadcast television distribution.

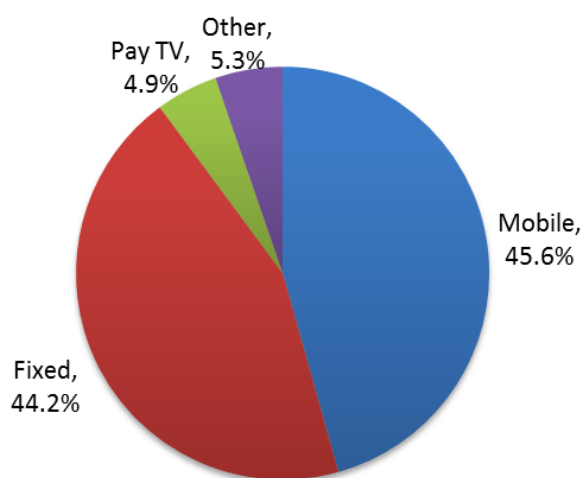


Figure 6 Breakdown of EU Communication Sector Revenues, 2010. Source EC DAE

In terms of financial characteristics, if we take the EU revenue figure and perform some analysis based on various sources (including reference to the 19 publicly listed historical incumbent stocks, noting the fact they include many international holdings) then we can estimate the following total operating cashflow and CAPEX for fixed and mobile. These are broad-brush aggregate level estimates but we have examined a number of operators in order to produce them.

€m	Estimated Fixed Sector
EU Est. Revenue 2010	145,000
Operating Cash Flow (OpCF)	36,000
OpCF/Revenue	25%
CAPEX	23,000
CAPEX/Revenue	16%
CAPEX/OpCF	64%

Table 1 Rough Estimate of Cashflow and CAPEX (Uses 2010 EU Revenues and 2011/2 Ratios).

Source: Ventura Team / Portland Analysis of Company Reports and DAE Scoreboard Documents

From this we can infer that much of current cashflow from the fixed network is invested back in CAPEX. In fact, CAPEX was almost two thirds of operating cashflow on average although the figures vary greatly by company. For simplicity, we assume that the altnets *in aggregate* have the same profile as incumbents.

This analysis must be treated with caution but nonetheless given that roughly two thirds of fixed cashflow is re-invested in CAPEX and dividends on average accounted for almost one third of operating cashflow for the listed incumbents, it is clear that there is little cashflow left for growth in the total level of fixed network on-balance sheet investment. In fact, in recent months there has been a trend to cut dividends as cashflows have come under pressure.

1.3.1 Reported Investment in EU27 Fixed Networks

Operators are investing in fibre access to some degree, mainly in greenfield situations, but it is difficult to estimate exactly how much. In fact, there is no easy way of determining the actual total of fixed network capital investment in Europe. Most operators have both fixed and mobile businesses (as well as other types of operation or foreign holdings) and even listed operators tend to report an overall CAPEX figure without providing a breakdown, even if they report specific KPIs for different lines of business.

The EU publishes an overall figure for investment in networks but this is a combined figure for both fixed and mobile – the ratio was 12.4% of revenue for 2010 according to the DAE Scoreboard⁵ based on €40 billion of CAPEX (compared to €46 billion we estimate above). Looking at the 19 incumbents listed on stock markets that we can identify, the average CAPEX/sales ratio of those companies is 15% although most have both fixed and mobile lines of business, and some have substantial operations outside the EU27.

<10% Sales	>10% <15% of Sales	>15% <25% of Sales	>25% of Sales
KCOM	DT, FT, Telefonica Grp, Telefonica Czech, OTE, Magyar Telekom, BT, TDC, Elisa, Belgacom, Telekom Slovenije	TI, PT, TPSA, TeliaSonera, Telekom Austria, KPN	TEO

Figure 7 CAPEX / Sales Derived from 2011 Financial Results. Sources: Company Reports, Thomson Reuters

⁵ This ratio excluded mobile CAPEX in the UK which the DAE authors did not have at the time of publication. We suspect the ratio would have closer to 13% if this were taken into account.

The DAE does not report cashflow from EU27 operations but looking at the 19 incumbents – which in many cases are really now international Groups based on a historical incumbent - listed on European stock markets then it seems from their 2011 annual results that for these companies:

- Operating cashflow is ~27% of sales;
- CAPEX is ~15% of sales:
- on average 55% of OpCF is re-invested in CAPEX
- around 27% of OpCF is paid out as dividends.

Unsurprisingly there was considerable variation by company both in the relative degree of cash generation (see table immediately below) and in the proportion of that cashflow re-invested in the year (see chart).

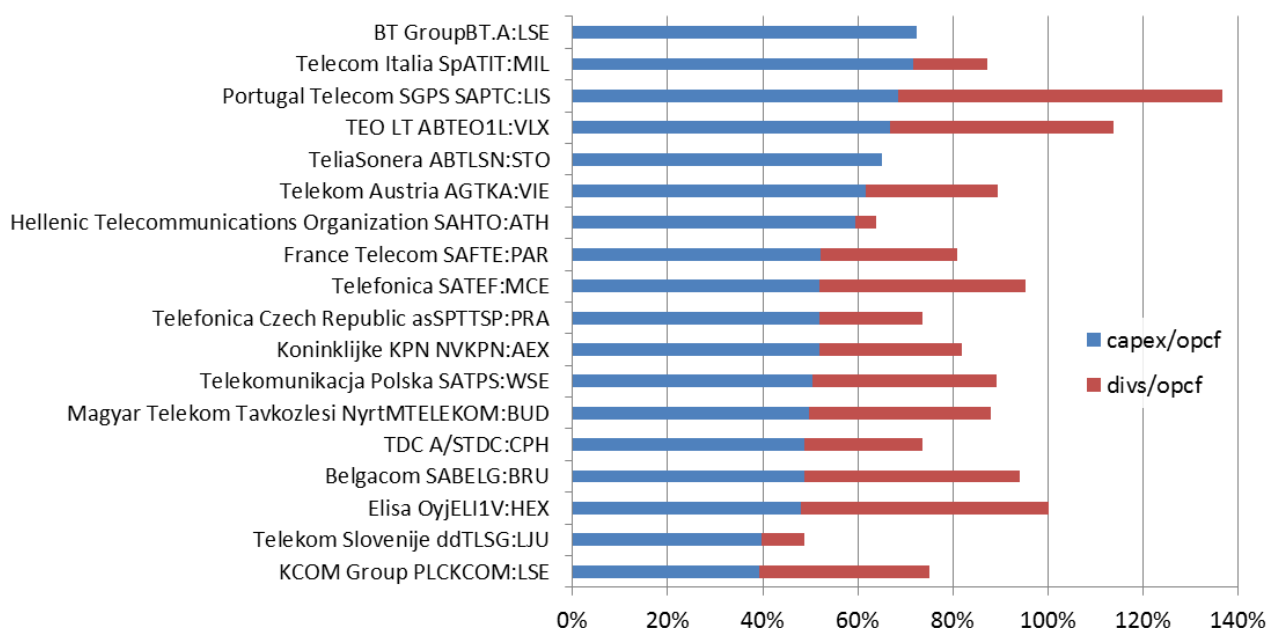


Figure 8 2011 Financial Results Cash CAPEX and Cash Dividends Compared to Operating Cashflow

Source: Thomson Reuters Data published by the Financial Times

The chart shows cash CAPEX invested in that year. The phasing of payments and capital expenditures will tend to be lumpy by their nature - even though operators try to smooth the phasing of investment programmes to manage the CAPEX budget for each year. Nonetheless, it seems to us that, based on these figures, **there is little scope in cashflow for any major increase in overall capital investment.**

Financials for fixed networks are not reported separately - even if certain KPIs, such as the number of lines, are provided by some companies. For fixed networks only, equity analysts New Street Research have analysed and tracked different lines of business for several years. They estimate that on average:

$$\text{fixed network CAPEX} / \text{fixed network sales} = \sim 16\% \quad (\text{detailed analysis of 14 publicly listed incumbents FY 2011})$$

This overall level of fixed network CAPEX includes all types of investment in fixed network assets of course, not just fibre access. Applying this ratio to the European telecom operators provides us with an estimate of €20 billion of fixed telco CAPEX per annum⁶.

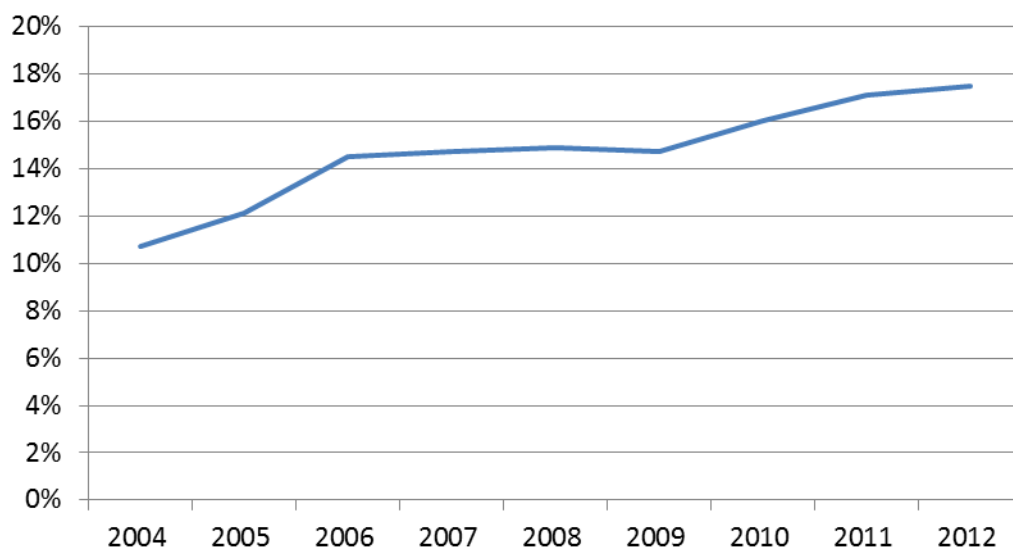


Figure 9 The Trend in Fixed CAPEX / Fixed Sales - Simple Average for 14 Listed European Incumbents.

Source: New Street Research

The above ratio is based on detailed analysis by equity analysts New Street Research of 14 incumbent operators specifically for fixed. In this report we extrapolate from these companies to generate estimates for the entire industry. The sample used of course includes the major operators so this seems to be a reasonable generalisation in our view.

1.3.2 Estimated Fixed Network Investment Specifically in Access Fibre

For some years fibre has been slowly edging closer to the customer - firstly going from the exchanges to primary aggregation points, then to high value areas, urban cabinets, to rural cabinets, to new build homes as they are constructed and so on. This means that telcos have already completed part of the job.

Of the overall investment in fixed networks, clearly, a proportion is already going into fibre but it is impossible to know what proportion. Such figures are rarely disclosed and the press releases for those that are tend to be very general so the scope or rate of investment is often unclear or disguised.

Without access to detailed confidential information and KPI's, it is not possible to be sure of the extent of deployment that has already been made but is not yet evident in the number of customer connections to ultra-fast services. However, the FTTH Council's annual *Panorama* report does provide an estimate of homes passed and homes connected to fibre.

⁶ We assume that revenues have fallen 10% since the DAE 2010 figure because of austerity and competition. We also assume that CATV and business fibre operators will have 40% share of black areas. Naturally, they are excluded from the telco CAPEX estimate.

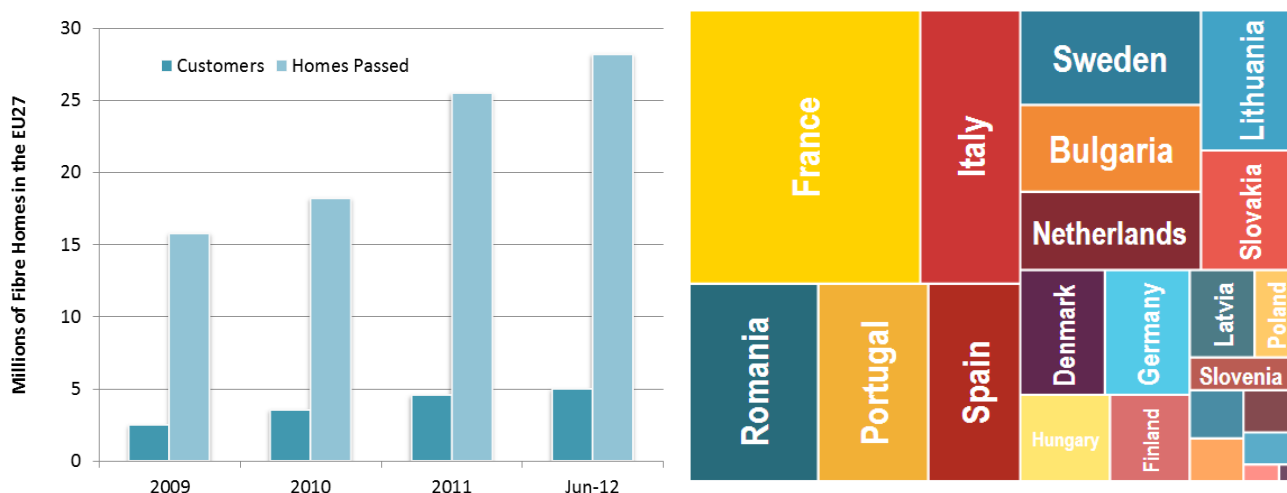


Figure 10 Growth in EU27 Fibre Homes Passed and Connected (at Any Speed) and Share by Country.

Source: Ventura Team / Portland Analysis of FTTH Council Panorama by IDATE

As there are 210m homes in the EU27, these figures show that only about 9% of homes are already passed by fibre. Using this Panorama data, combined with some rough cost assumptions, we have estimated indicative fibre CAPEX compared to the overall total and the level implied by steady state “contractual” replacement.

We estimate that cumulative past investment (both in homes passed by fibre and for the connections of those taking fibre services) is ~€11 billion running at less than €3 billion per annum on average.

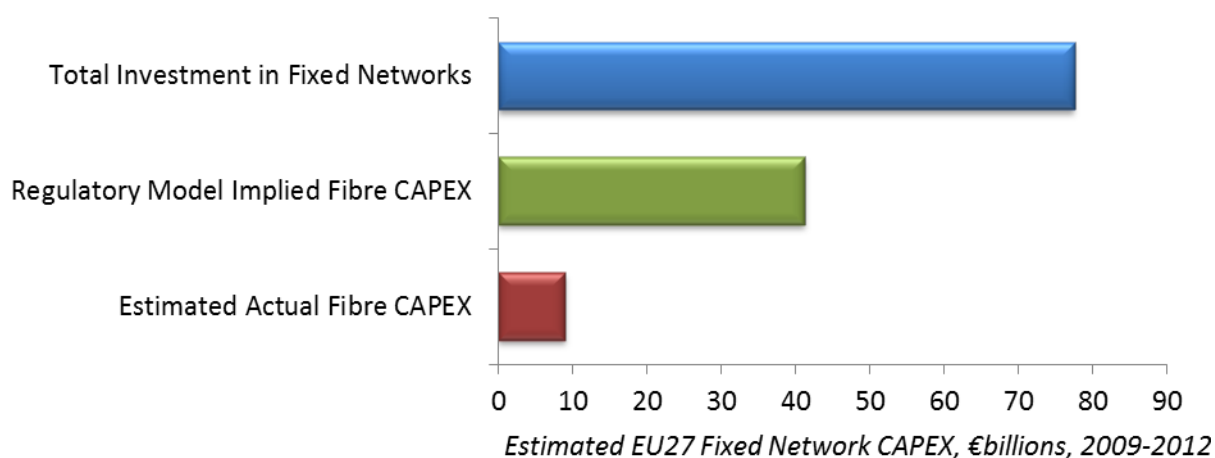


Figure 11 Recent Fibre CAPEX Compared to Total Fixed CAPEX and That Implied by Regulators' Cost Models

Clearly, the current level of investment is very low compared to that required for a Fibre Switchover.

At the current rate it will take 92 years to achieve the Fibre Switchover.

Putting the replacement element of current revenues (shown in green) towards the switchover would increase the rate of investment and bring that time down to roughly 25 years.

1.4 Examples of Operators Already Making a Fibre Switchover

The concept of a complete Fibre Switchover may seem overly ambitious to some readers. It is ambitious we agree but then we can also recall a time when changing every single TV in Europe from analogue to digital seemed outlandish. In the end, the TV switchover was accomplished. Although the investment required for a Fibre Switchover is much higher, we also believe that the Fibre Switchover will be accomplished and the benefits will be considerable and enduring. The question is not *if* but *when* and *how fast*?

There are already a few examples of wide-ranging FTTH deployments by incumbents that have accelerated the natural replacement cycle. These examples show that a switchover is possible and indeed a gradually growing number of countries worldwide are developing programmes towards this. We briefly discuss three examples below which show in different ways that not only is a switchover practical but it can also be financeable.

1.4.1.1 Verizon FIOS, USA

Starting in 2004 Verizon, a US regional incumbent formed from Bell Atlantic, NYNEX and GTE, made a major commitment to fibre, making franchise and regulatory agreements across areas covering almost 20 million homes. The programme was intended to allow the company to compete with cable television operators and also to reduce operating costs. According to the New York Times in 2008, *"Everyone understood that the copper wires of the phone system were being left behind by the faster networks of the cable industry. But why spend so much money on new wires when cellphones are becoming ubiquitous and profitable?"*⁷

If it did not pursue this programme, we surmise the company would have faced progressively losing market share to cable companies (and mobile) and would be left with fewer and fewer customers on an aging network that would become more and more costly to run. Reportedly, some additional price increases were allowed by State regulators in light of the investment programme.

According to one analyst, the \$23 billion seven year construction programme did not make any material impact on the long-term rate of CAPEX. In other words, the company simply invested in modernisation of the network within their traditional CAPEX envelope.

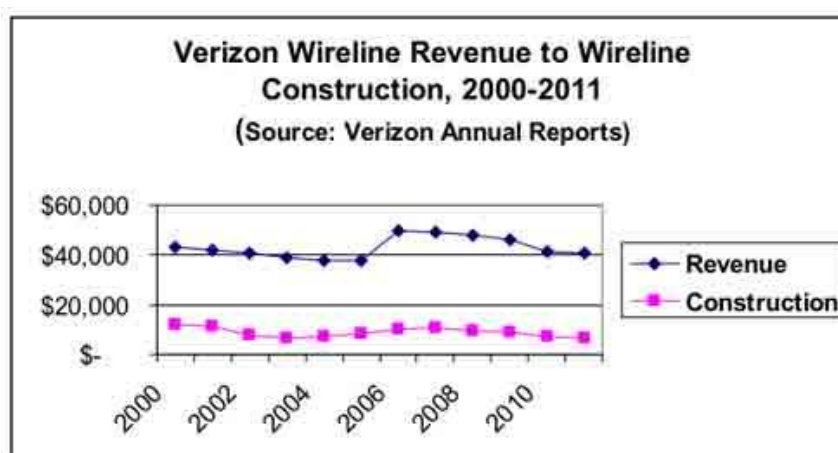


Figure 12 Unverified Analysis from Nieman Watchdog, "The Great Verizon FiOS Ripoff", May 2012

⁷ http://www.nytimes.com/2008/08/19/technology/19fios.html?_r=1&partner=rssnyt&emc=rss

In terms of preserving Verizon's fixed line business, FIOS seems to have worked. According to their January 2011 earnings release they had "4.1 million total FiOS Internet customers and 3.5 million total FiOS TV customers; a 10.7 percent increase in consumer {wireline} ARPU from 4Q 2009; FiOS revenues now represent approximately 53 percent of total consumer revenues."

The CFO recently stated "we are not passing more than we originally said. We will still end up at around that 18 million to 19 million mark from a pass perspective. And at this point we won't build beyond that, because at this point we have to capitalize on what we have invested". In short, the company selected the specific areas for which there was a strategic business case and will not upgrade the others preferring instead to invest in mobile.

Verizon is listed on various stock markets with the primary listing being on the main New York Stock Exchange. Comparison of its share price with the main New York Dow Jones Index shows that the company has generally kept pace with the market throughout the period of FIOS with a slight tendency to underperform. Whether this is statistically meaningful or related to FIOS as opposed to other factors are not possible for us to assess.



Figure 13 Share Price of Verizon v the Dow Jones Index Since the Start of FIOS in 2004. Source: Google Finance

1.4.1.2 Etisalat, United Arab Emirates

From 2008 Etisalat started a national copper replacement programme which is due to be completed this year according to some reports. The capital city, Abu Dhabi, became all fibre in April 2011. At the end of 2011 56% of premises nationally were on fibre compared to 31% at the end of the previous year.

The company has a duopoly with the much smaller *du* and does not face cable competition. We believe that the UAE, population ~8 million, is now largely served by FTTH.

The programme ran largely as a technical modernisation for the first three years although it enabled the existing eLife CATV service to be promoted in new areas. Customer connections were upgraded in a rolling programme with no major change in products on offer although we understand there were some new options and upselling opportunities in the later phases. Now the infrastructure upgrade is complete the company has stepped up marketing of new faster Internet speeds and its eLife cable TV style service.

Etisalat is listed on the Abu Dhabi Securities Exchange but is majority owned by the UAE Government. CAPEX / revenue peaked at 16% in Q4 2011 and has now fallen to 10% (Q2 2012).

1.4.1.3 JT (Jersey Telecom), States of Jersey

Last year JT announced its Gigabit Isles programme intending to replace all copper connections with fibre over four years. The first fibre area is live and customers are migrating with nearly half choosing to upgrade their current speed. Some customers already have connections at 1 Gigabit/s although this is designed very much as a premium product.

Ventura Team were the consultants to the company during the definition of the business case and programme and continue to support the implementation phase. With the agreement of JT we can confirm that:

- A decision to run a single network rather than copper / fibre hybrid was justified on financial grounds;
- There will be a reasonable financial return from the programme;
- The island will have made a complete switchover to fibre by 2016.

Jersey Telecom is a company fully owned by the States of Jersey.

1.5 Why Has The Timely Renewal of the Copper Local Loop Not Already Happened?

The three examples in the previous section are the exceptions, the early adopters. Although a handful of other countries also have switchover (or part-switchover) programmes, in the EU27 there is no concerted effort towards large scale - let alone complete - replacement of copper. All our interviewees accepted that the industry is changing and that at some point in the (distant) future fibre will inevitably become predominant in telco access networks. However, opinions differ greatly as to when, and how rapidly, this modernisation might occur.

Operators make business case decisions based on expected positive changes in future cashflows resulting from the investment action taken. An investment can either grow new cashflows (“greed” driven) or prevent the loss of existing cashflows (“fear” driven). For any established and financially driven operator the motivation for investing in FTTH – either greed or fear – must be sufficiently pressing or the only rational strategy is to do nothing and use the cashflows from access to do other things with rather than dig up the streets.

Although there have been pockets of strong competitive or governmental pressure, in most of Europe so far there has been no real spur for investment in fibre. Instead the cashflow from obsolete assets written off a long time ago (i.e. the copper local loop) has been essentially free money for the telco (i.e. an excess return on a life expired asset) and **it’s impossible to find a business case that beats free money**. With relatively few local exceptions there:

- Is no greed based case because there will only be a premium for fibre late in the process of national migration – at the moment copper access sets the price point for the consumer and defines the major products for the operators;
- Is no fear of competitive entry or of regulatory action that would reduce the price for copper access and therefore cashflows – in fact the regulator allows continuing healthy returns to be earned on those obsolete copper assets.

The result is a low level of investment in fibre by incumbents, which given the incentives they face is entirely rational behaviour. Only where there has been a material and immediate threat (e.g. part of South East

Europe 2007-9) have incumbents rushed to deploy. Elsewhere operators have expanded internationally, developed mobile networks, paid dividends, run share buy-back schemes etc. because the upside business case for fibre was not strong enough compared to other possible uses for cashflow from the access network.

These activities are commendable but arguably should have not have been funded using charges justified on the basis of timely asset renewal. It seems to us that there is a regulatory anomaly whereby telcos are effectively paid for the timely renewal of local loop assets but do not actually do so.

This anomaly seems to have developed unnoticed by regulators because until now there was no pressing need to replace the local loop and the very long assets lives assumed perhaps served to obscure the looming end of the age of copper. There is also perhaps an issue of timescales – the asset life of much of the access network is unusually long and is perhaps some 4-5 times the expected time in office of any Chief Executive. This, and the focus on quarterly performance imposed by the stock market, militates against long term commitments. In contrast, of course, infrastructure funds – which we discuss later in the report in Section 3 – are specifically constituted to fund long-term infrastructure projects.

Our view is that this regulatory anomaly developed because physical infrastructure has an extremely long life compared to electronic assets so the issues of obsolescence and timely renewal have gone unnoticed.

The customer is already charged for this replacement as an integral component of regulated tariffs. Now surely is the time to end this anomaly and ensure that assets are replaced in a timely fashion.

Removing this anomaly would help move Europe towards a Fibre Switchover over 20-25 years but, even if energetically implemented, it is unlikely to be a sufficient incentive alone. This is because of the economics of the white areas.

1.6 A New Model is Needed if Private Telcos are to Renew the Grey/White Areas

Increasing the background rate of local loop modernisation may only benefit the black areas and perhaps parts of the grey. This is because it is likely that the white areas and parts of the grey areas are fundamentally uneconomic. We further believe that marginal grey areas may be rendered so by a lack of geographic de-averaging of prices. Verizon's selective deployment is a real world example of this rational decision-making.

The relative unit cost of constructing a wired network between black and grey/white areas has probably not changed much since the birth of telephony a hundred years ago. The relative input in terms of labour (by far the dominant element of cost) has not greatly changed. Looking back, we can perhaps infer that the white and grey areas were probably never an attractive proposition for construction of wired telecom networks.

The underlying economics have not improved – in fact they are probably worse. In the interviews a number of CTOs were asked a hypothetical question:

“If by Law you could not use copper tomorrow, what would you do in the grey/white areas?”

The interviewees immediately answered that they would switch off service. They answered in this way in a split second without hesitation. The received wisdom in the industry is that when faced with a complete renewal of infrastructure, these areas – or certainly substantial parts of these areas - are simply not economic.

So how was service to rural areas funded originally? Taking the long view of history two key factors – neither of which apply today – stand out:

- The first telecom networks in Europe were built in urban areas. In those countries with vigorous competition, they grew very rapidly.⁸ However, to serve the countryside was expensive and the general approach was to nationalise and cross-subsidise. **State owned PTTs used cross-subsidy within a protected legal monopoly to finance ubiquitous coverage.** The cost of serving these areas was borne by spreading the cost of universal service across all customers, and in particular making the business customer pay far more than they would have in a competitive market. Although inefficiencies and distortions were commonplace, this approach did at least provide national coverage. Only in Finland was there a significantly different model of local cooperatives resulting in a form of self-build and community telco that ensured services were provided eventually to even the most remote areas. Today Finland has several local fibre co-operatives re-inventing this old model for the new century.
- The **fixed telephone took the entire share of GDP that customers were willing to spend on telecom.** We have not calculated this but we suspect that in real inflation and GDP deflated terms, the revenue per line for a fixed connection compared to the labour cost of construction may well have significantly higher some decades ago than it is today. The difference of course is that mobile phones and mobile data have taken more than half of the total spend in telecom and continue to grow in popularity. They are not perfect substitutes but do act as partial substitutes for fixed.

In short, the two fundamental factors enabling the original construction of wired networks in white and grey areas are now absent. A new model for financing fibre construction in the grey/white areas is clearly required.

Governments have already agreed that 100Mbit/s should be commonplace across the EU27. Regarding implementation of that goal, policymakers face a tough decision:

EITHER carry on muddling through and accept that fibre will only reach all corners of Europe over something like 90 years;

OR make some significant changes to policy and regulation and stimulate (at relatively modest cost to the taxpayer) the market to deploy fibre everywhere in 12-15 years.

We favour the latter “Fibre Switchover” option and believe that the costly and wasteful period of parallel operations within a locale of copper and fibre networks should be minimised as far as possible. Government Authorities will need to adopt smarter intervention strategies to generate private sector investment on the scale needed in the white areas and much of the grey areas.

⁸ London, Copenhagen and Helsinki in particular.

2 Regulatory Levers Available to Stimulate Fibre Investment

In this section we discuss the major regulatory factors affecting the rate and extent of investment in fibre. What is fundamental though is the need for a vision. Each of these levers – and no doubt many other aspects of regulatory practice – are applied or used or designed based on assumptions about the industry and the “right” policy or balance of interests or desired outcome.

Without a clear vision, regulation will be what one specialist described to us as a “random walk” by which he meant that regulation follows a random and unpredictable path without necessarily any linkage between different actions or decisions.

Of fundamental importance is the need for a clear vision of, and commitment to, the Fibre Switchover to be adopted throughout the industry. The Fibre Switchover vision will have to be consistent with the operators’ operational constraints, their legitimate ownership rights and valuation of their legacy networks assets. Otherwise, the consequences of unavoidable conflicts would ruin the potential public benefits of such a vision.

On the assumption that there is a common purpose towards a Fibre Switchover, we have identified three major regulatory levers:

- Asset lifetimes and timely replacement
- Strategic pricing (for wholesale/internal access)
- Modernising the concept of universal service

We also discuss the cost of capital.

2.1 Timely Replacement

It is only now with the need to upgrade from copper to fibre becoming evident that the longstanding practice of ignoring the asset refresh cycles assumed in tariff models is becoming an issue.

In the costing models that determine the regulated elements of the phone and broadband bill that consumers pay there are many embedded assumptions. Of fundamental importance are the assumptions regarding asset life and average utilisation. These three factors together largely determine how much the customer is charged. Because of this mechanism, customers of regulated operators are already paying for the modernisation of the infrastructure in their monthly bills. In fact, they have been paying for this modernisation for many years. Although there is no legally binding contract for the timely replacement of assets, we take the view that there is at least a “social contract” to do so. Otherwise, what is the meaning of, and justification for, the regulated tariff?

From the point of view of fibre, the critical asset refresh assumption is that the local loop will be periodically replaced and modernised. However custom and practice has developed such that it was widely accepted that copper need not be replaced with its “modern equivalent asset” i.e. fibre, even though customers are paying towards this in every bill.

In the past, when fibre was seen as a technology of the future this perhaps did not seem to matter, but now it is obviously a matter of concern for policymakers and may become so for the public.

At present, the requirement for timely asset refresh, which is a social contract between the people (as represented by the regulator) and the telco, is routinely ignored in practice. In our view, customers are entitled to receive the modern high performance network that they have been paying for.

One regulator has justified the lack of renewal by describing fibre as a luxury product. Our view is quite the opposite – fibre has a lower lifetime cost than copper and delivers a great deal more in terms of bandwidth and potential future innovative services.

Last year, in the absence of powers to enforce the social contract for replacement, the European Commission suggested cutting prices for the use of copper. We have always believed this would be counter-productive. Lower prices will simply increase payback times and mean less investment in the industry when instead we need more investment.

Customers are self-evidently willing to pay for broadband and telephone at current prices and are also willing to pay for timely modernisation; in fact they are already paying. The emphasis should be on delivering what they are paying for rather than on cutting prices.

2.1.1 Estimating the Level of Capital Investment in Fibre Implied by the Social Contract

As we explained above, the social contract embedded in the regulatory cost models implies, in our view, replacement of assets based on a realistic lifecycle. If we accept that the asset lives used in the prevailing type of regulatory models are broadly reasonable, then it is straightforward to estimate annual rate of asset renewal that customers are paying for. From that rate, using an assumption about unit costs we can also then determine the level of renewal investment implied in Euros.

To estimate these figures we will:

- 1) Use an estimated figure of 220 million premises in the EU27. The number of homes widely reported is 210 million and we have used this figure plus 5% non-home premises based on experience.
- 2) Use the FTTH Council geographic information system (GIS) estimate but model adjusted to go beyond the DAE targets and address all buildings and households.
- 3) Distinguish between buried and overhead local loop because the regulatory asset life is significantly shorter for overhead.
- 4) Assume a mix for current buried and overhead accesses based on interviews and various private sources. We have not been able to find a public source for this information.

Based on this approach and making the assumptions shown in the table below (for *Buried* access fibre and *Overhead* cables) we estimate that an implied average replacement rate of around 3.8% per annum is implicit in regulated prices. This is the blended rate implied by a rough assumption of the mix of local loop asset lives as shown in table below.

	Buried	Overhead	
Assumed mix	66%	34%	
Typical regulatory asset life	37	17	
Annual replacement rate customers pay for:	2.7%	5.9%	3.8%

Figure 14 Estimate of Access Network Renewal Rate Embedded in Regulated Prices

Source: Ventura Team / Portland Advisors

Using this replacement rate we can estimate the equivalent implied “contractual” level of capital investment recognising of course that not all access operators are regulated so this figure is a guide. Our estimate, assuming that replacement investment were made pro rata to population between black v grey/white areas, is that background replacement CAPEX for the access network should be running at roughly €10 billion per annum.

2.1.2 Indicative Estimate of Under-Investment in Fibre Access

As explained in section 1 above we estimate total fixed network investment to be roughly €20 billion per annum. We also estimate that €10 billion pa is the local loop renewal investment implied by a typical regulator’s cost model. From the FTTH Council Panorama data we believe that investment in fibre is probably running at around €3 billion pa (this is a rough indicative figure). The cumulative figures are shown on the chart below.

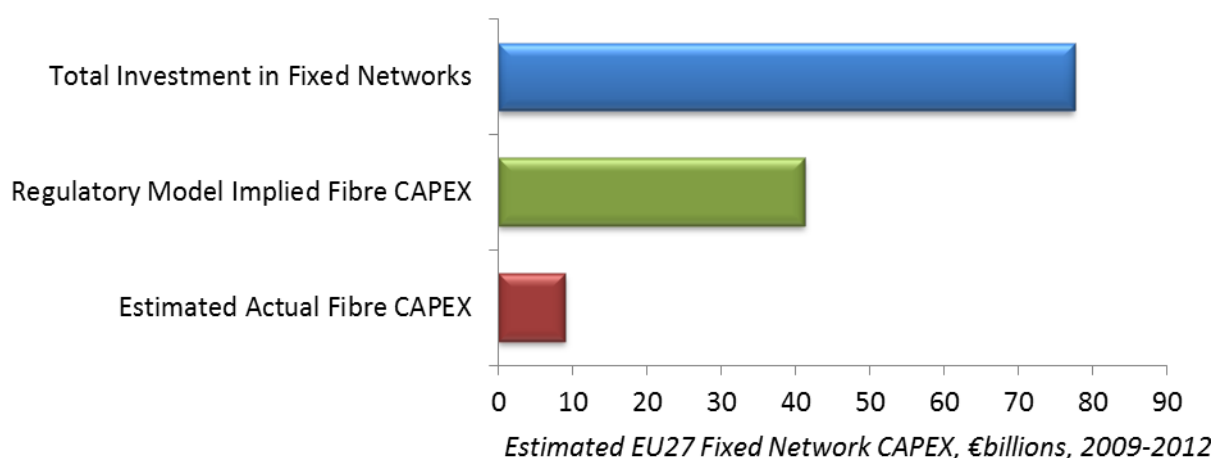


Figure 15 € billion CAPEX Fixed Network Total v Implied Regulatory v Est. Actual

Sources: Ventura Team based on FTTH Council Panorama 2012 and New Street Research

Taken across the EU27 as a whole, and subject to the caveats above, we estimate that capital investment in access network renewal, as implied by typical regulatory asset lives, should be around €10 billion each year. Actual investment has been running at less than one third of that level. The shortfall averaged about €7 billion pa over this period, equivalent roughly to 140,000 jobs each year in installation.⁹

Of course there is a margin of error in these figures as costs vary greatly between locations within a country and even more so between different countries.

2.1.3 Debate Based on the Average Contribution to Renewal of €2.40 / Month Would be Misleading

It may be tempting to take the implied annual investment of €10 billion that customers already pay for renewal and divide it by the total number of fixed telephone lines and broadband connections to work out a figure of around €2.40 exc. VAT per month per product (so for a double play customer it would be €4.80). Such an average, although arithmetically correct, would be highly misleading if applied to any single country or operator.

⁹ This figure is again only an indicative estimate using gross earnings weighted by size of fixed network and providing a proportion of investment for materials, taxes and so on.

As we noted in the section above the figure is an estimate due to the variation of underlying factors. For example, average gross earnings (and so construction costs) vary by a factor of 13:1 within the EU. Project costs will most likely vary even more widely because the terrain ranges from tundra to dense cities. Average densities and building types (and proportion of MDUs) vary between urban areas according to national patterns. In rural areas the pattern varies considerably - some countries having tracts of dispersed smallholdings or widely spaced homes whereas in others the rural population is relatively dense in a number of discrete settlements perhaps along a road.

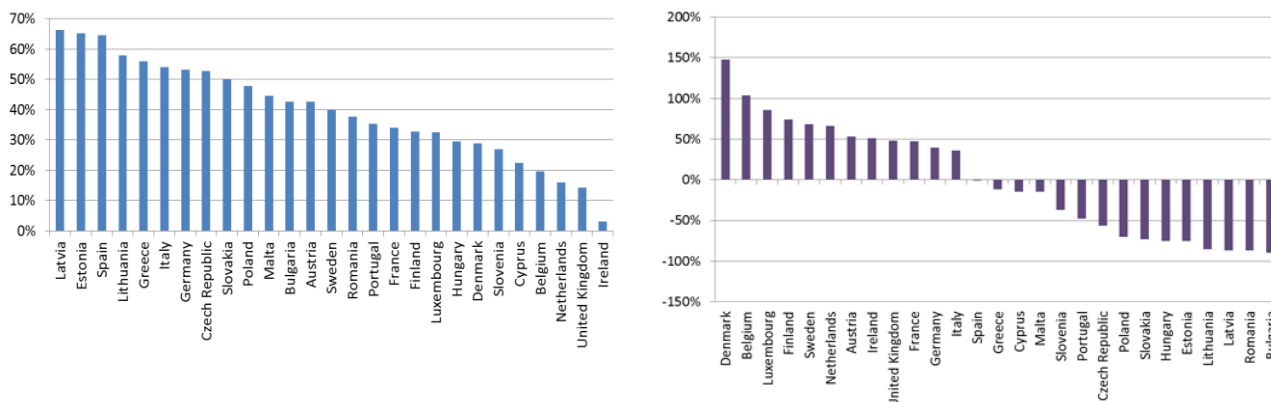


Figure 16 Variation in Proportions of MDUs in Housing Stock (left chart) and Average Business Earnings (right chart) across the EU27. Source: Eurostat

As shown above, both labour costs and the proportion of relatively low cost to serve MDUs (multiple dwelling units – i.e. apartment blocks) vary greatly across the EU. For such reasons an EU27 average figure cannot be applied to any one country or operator.

2.2 Wholesale Pricing of Fibre v Copper

Although policymakers and operators must plan long term, consumers make buying decisions in the moment. Price is always an important factor if not *the* factor.

Markets only work efficiently if price signals accurately reflect the underlying economics. Fibre access is fundamentally cheaper than copper. It is important therefore that wholesale prices reflect this fact. Fibre customers should not be penalised for the inefficiencies and falling asset utilisation of copper.

An important driver towards the Fibre Switchover will be that wholesale prices for fibre are sufficiently below those for copper, reflecting the underlying economics and perhaps an element of strategic pricing to help encourage technological migration. At the same time, it will be crucial to keep overall prices up or even rising so as to sustain investment. Such strategic pricing will encourage retail service providers to actively market fibre products as replacements for legacy services and thus help drive the switchover. The quid pro quo of course for any premium on copper is that the proceeds should be directed solely into fibre investment ideally under a contractual or semi-contractual framework that is transparent and ensures fair delivery for the investment backed by clawbacks or other penalties for non-performance. Of course, differences in timing of cashflows (new build versus legacy of written off copper) need to be managed to ensure incentives reflect financial constraints and this is a complex area. However, such factors should not be confused with the enduring difference between fibre and copper in terms of the underlying long-term cost of the network.

Current regulatory practice in Europe does not clearly reflect this. Earlier this year WIK surveyed the wholesale charges for fibre access as part of their *NGA Progress Report, March 2012* for ECTA. Comparing their figures for unbundled fibre rental to the LLU monthly rentals reported in the DAE Scoreboard suggests that there is a significant premium charged for fibre access in the UK and the Netherlands but not in Sweden. In Sweden the price for fibre rental is actually slightly lower than for copper according to WIK and this is what we would expect from a properly conducted costing exercise (although we doubt that such a small difference would do much to accelerate Fibre Switchover).

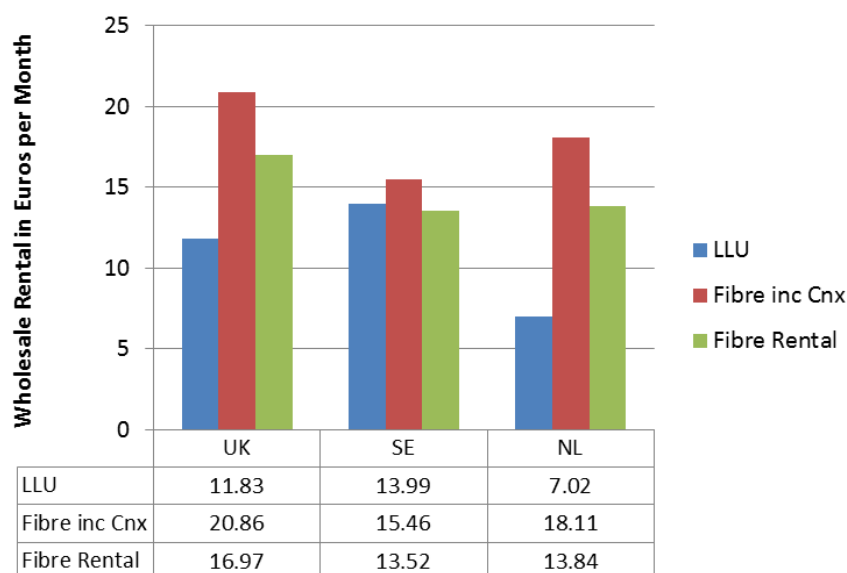


Figure 17 Comparison of Wholesale Prices, Fibre v Copper LLU

Sources: WIK NGA Progress Report March 2012; DAE Scoreboard

Whatever the underlying cause for the counter-intuitive results reported by WIK, setting a premium price for fibre at the wholesale level will result in a premium price at the retail level and that will be a major deterrent to a full mass-market fibre switchover. The Swedish charging model is, obviously, more conducive to a full switchover but in our view the price discount is too little to generate pull from retail service providers to migrate customers to fibre and we doubt that it reflects the full whole life cost reduction fibre will bring.

If we regard fibre as the Modern Equivalent Asset (MEA) for a copper access network then, as we understand it, logically the wholesale price for each should be the same and based on the cost of efficiently constructing a new fibre network. Given the magnitude of investment, even modest rises in regulated rates will help fund the switchover and if copper prices rise faster than fibre it would have three benefits:

- Copper rates would reflect the expected rising operating costs and falling utilisation of that technology as it fades out;
- Cashflows on obsolete assets – and particularly extra cashflow generated from any price rises – could directly support increased investment in renewal, ideally in a transparent contractual or semi-contractual framework;
- Service providers & customers receive economically correct price signals so encouraging switchover.

In our view a difference of 15% or more between the price of fibre (lower) and copper (higher) needs to develop over time in a contractual framework that ensures that excess returns on copper are devoted to funding the Fibre Switchover.

2.3 Modernising Universal Service

The concept of universal service is that a reasonable quality of access to the network should both be:

- Available throughout the relevant geography even to remote settlements;
- Affordable by the great majority, or even all, of the population.

Originally a purely political objective, there are also externality effects arising from the fact that a larger more extensive network is more useful to all those connected. This means that there is an economic benefit to all from ensuring marginal or remote users are connected. Whether this externality applies nowadays to fixed networks (given the prevalence and extensive coverage of mobile) is perhaps less clear. Nonetheless, we find it difficult to imagine that only partial fibre availability would be politically sustainable in the very long term – there will be surely pressure to avoid such a divide and it seems to us a question of when rather than if Government intervention will seek to spread fibre well beyond the black areas.

As we noted in section 1.5 above, the original deployment of wired networks in white (and probably the majority of grey areas) was funded by cross-subsidies from business and urban customers to those in uneconomic areas. Given that such areas are believed by many to be fundamentally uneconomic, the concept and mechanics of universal service need to be modernised.

Universal Service as currently defined is based, we assume, on ubiquitous legacy access networks. It seems highly likely to us that the concept, procedures and funding mechanisms need to be modernised to reflect the Fibre Switchover.

USO funds should support fibre deployment while ensuring that any strategic increases in copper prices do not unduly reduce affordability in the interim period. Any such funds should, of course, be disbursed against transparent and contractually binding deployment schedules in line with the more explicit and contractual style of regulation of the Switchover that we recommend in section 5.1.

In essence, customers in black areas already pay some element of USO costs and will need to keep paying or possibly increase such payments in order to help fund the Fibre Switchover in white and grey areas. However, as CATV operators in some areas have 40% or higher market share, there is a clear implication arising from this as follows.

To ensure a level playing field the mechanisms of regulation and universal service should apply equally to all major operators in black areas. In our view, the access market should be considered not as a national market but divided into at least black, grey and white and that regulatory policies and levies should be symmetric i.e. be fairly applied to all in the black areas. In practice, this would mean that cable television operators and major business access providers should contribute fairly to a modernised universal service scheme - if they do not already do so.

2.4 Regulated Returns and Cost of Capital

Regulated prices are in part determined by the weighted average cost of capital (WACC) assumed – i.e. the return that should be made by the operator on a capital investment. The idealised WACC used for regulatory calculations is a function of an assumed capital structure for the company, the general cost of money and the riskiness of the telco business as measured by the beta (variability of the share price – see the theory of the capital asset pricing model for more detail).

In the current climate, telecom operators are relatively safe stocks. The average beta of the 18 incumbents we examined is 0.6, which being less than 1.0, means that on average their share prices are less volatile than the average of the stockmarkets on which they are listed. We could observe in the data however that a beta of 0.6 is only 5% more 'risky' than listed European water utilities and 20% less 'risky' than the average of the largest 30 electricity utilities.¹⁰

However, with the exception of BT, these incumbents have both fixed and mobile businesses and some of the larger ones have significant operations outside the EU. This means isolating the cost of capital relevant to their home market wired local loop is a complex matter and well beyond our scope. In any case, regulators may prefer to look forward than to simply examine the current beta. The process used is complex and requires a great deal of judgement.

Some respondents suggested that regulators have habitually been generous in their allowance for WACC in the past and we suspect there is at least a lag between modification to the regulated WACC and monetary conditions – at present the cost of money is unusually low and some suggest that the equity risk premium has also greatly reduced.

In any case, based on simple modelling we believe that the scope for incentivising a change in investment patterns by manipulating the regulated rate of return is limited - although it may be effective in some cases.

If such a deal were to be done, then experience to date suggests that a regulator would be wise to secure written agreement on a contractually binding deliverables (in terms of say additional fibred homes by a certain date, quality of the infrastructure, operational metrics etc.) with suitable penalties for non-performance.

¹⁰ We compared our telco sample of 19 to the 5 year beta of European water utilities listed on FT.com. The sample of listed water utilities is modest being only 15 companies whereas for electricity we used the 30 largest by market cap. Telco 0.6, water 0.56, electricity 0.77. The average of the top 20 electric utilities was 0.6.

3 Financing the Fibre Switchover

3.1 Sources of Capital in the Current Climate

Since 2008, the European banking system has generally been in a state of crisis with European Governments struggling more-or-less to bail out their ailing banks. It would therefore seem to be an unpromising time to be suggesting a new approach to the Capital Markets for €100-€200bn in infrastructure financing. However, it is also true to say that this current crisis in capitalism has focused Governments' minds upon macroeconomic growth, which could be stimulated by capital spending. Consequently, the economic debate has, largely become focused on how to get the "best bang for your buck" from spending on infrastructure - even within politically non-interventionist authorities. The Connecting Europe Facility (CEF) is just one example of this trend.

3.2 Financiers Want To See Telecom Projects That Meet Their Investment Criteria

Our survey of the Capital Markets in relation to telecom finance, took in a number of methodologies:

- we estimated the potential for telecom infrastructure financing based upon historic volumes in infrastructure financing and the telecom share of that overall pie;
- we also calculated the ability of incumbents to gear up their balance sheets to sensible corporate levels of borrowing (i.e. 3x EBITDA), and
- we interviewed various financiers including banks and private equity funds dealing with both project and infrastructure financing, and also multilateral lenders with an infrastructure mandate.

Essentially, the message from the capital markets was that whilst they are happy to lend to their core relationship clients who have strong balance sheets (i.e. mostly the incumbents and some of the larger cable operators / altnets), they were unwilling to lend to new entrant projects. Such projects contain too high a level of market risk (i.e. the financiers found the revenue prospects too uncertain).

Of course, this approach also has a clear implication for infrastructure competition in telecom – it seems unrealistic to assume any material growth in the extent of access network infrastructure competition in current circumstances. Regulatory policy – which has largely focussed on fostering such competition in the past – should be more balanced and we suggest now assumes that grey/white areas will remain monopolies. This also means that the incumbents face little threat in these areas and, without a change in regulation, will tend to 'sweat' copper rather than replace it.

3.3 Sources of Finance

Investors, if they consider they are taking a greater risk, will naturally require a greater (potential) reward. The graphic overleaf illustrates this relationship for different types of investor covering various stages of a project from inception where risk is highest to its mature low-risk phase.

3.3.1 Venture Capital/Early Stage “Greenfield” Investment

Our interviews with the venture capital market confirmed the fact that these financiers’ criteria of medium-term, high return investment do not fit with the long-term characteristics of infrastructure projects where returns on equity are much lower than Venture Capitalists’ hurdle rates. Consequently, we discounted this market as unlikely to have a major part to play in funding FTTH Projects.

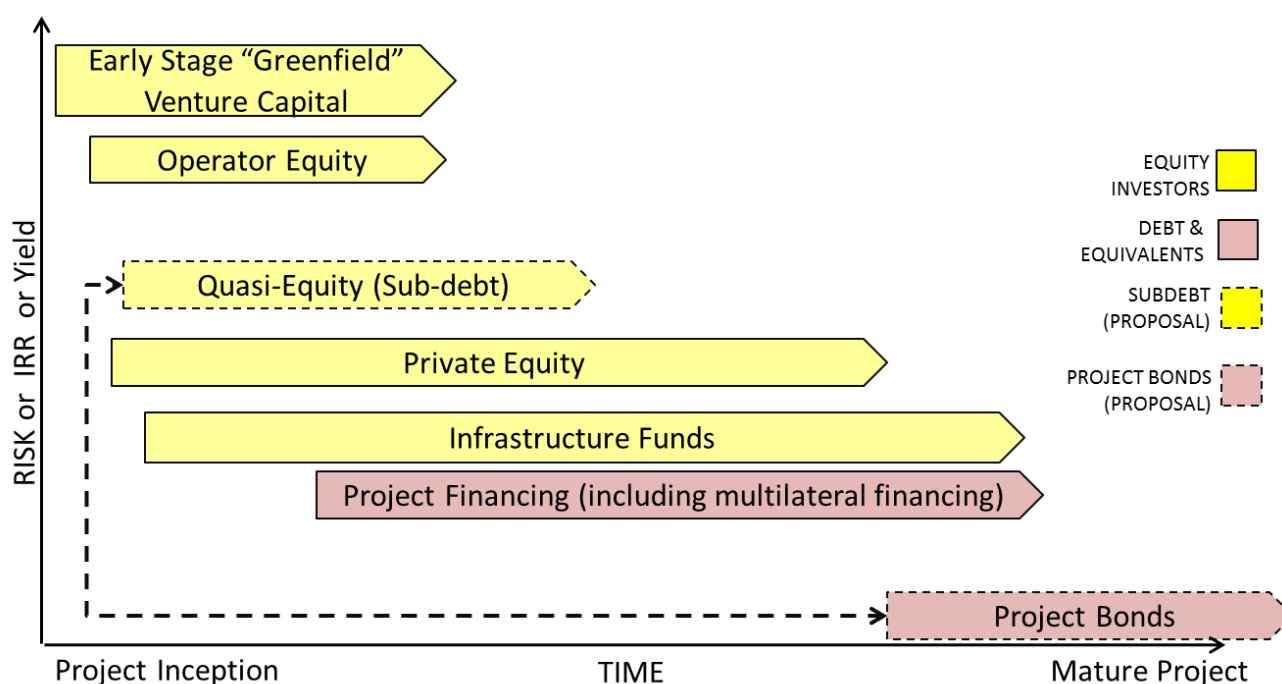


Figure 18 Risk v Reward for Different Types of Finance Relevant to Access Fibre.

Source: Portland Advisors / Ventura Team

3.3.2 Private Equity & Infrastructure Funds

In our research, we talked to both general private equity finds (that have recently focused upon M&A and MBO/MBI activity) and to infrastructure funds. Infrastructure funds have return requirements and investment horizons geared to infrastructure projects and this makes them ideal candidates to invest in FTTH either alongside, or as junior investors, to the banks.

Infrastructure funds raise their money from pension funds or insurers, who are now increasingly coming under political pressure to invest in capital projects such as broadband rollout. Such funds look for long-term contractual cashflows (say over 25 years), and little or no volatility in returns. The current push by Eurozone governments to involve the pension funds & insurance industry to a greater extent in the financing of growth infrastructure is likely to increase liquidity for these funds. This will increase pressure on them to get involved in financing fibre infrastructure. Unsurprisingly, we found that these funds can only lend to

stable (i.e. monopoly) projects and are simply unable to invest in venture capital style new build projects due to there being too much market risk.

3.3.3 Project Financing

This form of financing is sometimes called “limited” or “non-recourse” because it is not backed by assets or guarantees but by the project itself. Debt is kept off balance sheet in a Special Purpose Vehicle (SPV). The borrower is then merely a Sponsor of the SPV. Funders only have “limited recourse” to the Sponsor, relying instead on the strength of cashflows through the SPV.

Consequently, funders will rely upon the “visibility” (i.e. predictability) of the cashflows. Lenders look to see whether any potential volatility in cashflow may be compensated for by debt coverage (i.e. that amount by which cash available for debt service exceeds obligations). The projected coverage ratios under a range of downside scenarios must give banks enough confidence that debt service can be maintained even in the face of volatile cashflow conditions.

Such loans tend to have greater numbers of cashflow covenants than a corporate loan; enhanced opportunities for banks to get involved in the project should things go wrong; and, potentially, mechanisms to dynamically reduce the tenor (duration) of the loan should the project over-perform.

The messages that we were getting from the Financiers we surveyed tied very well into the results of our desk research. We expected to find a lack of Project Financing activity, and this was borne out by the numbers from the industry databases, which showed us that Telecom has been punching well below its weight in terms of attracting its “fair share” of infrastructure project financing. The figures below illustrate the Global situation in terms of targets for Infrastructure Project Financing, but we feel that this accurately reflects the European situation.

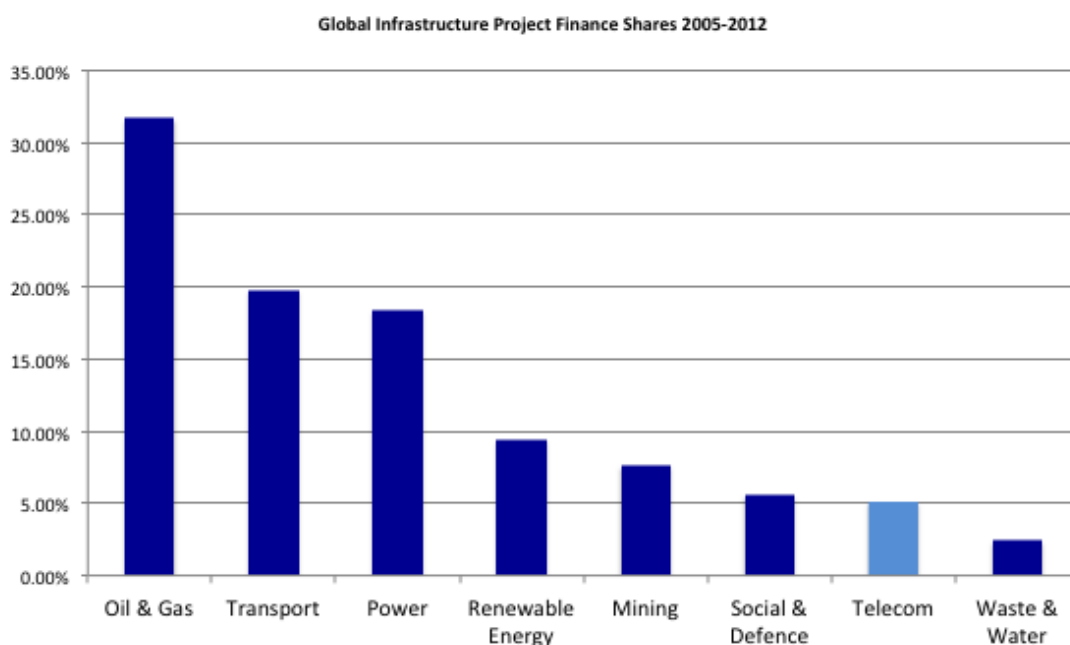


Figure 19 Summary of Global Project Financing by Sector 2005-2011 Source: Infrastructure Journal

3.3.4 Senior Debt & Equivalents

Senior debt are those financial instruments that get repaid first (i.e. have first call on cashflow – hence the name senior) and/or have first-ranking security. These instruments accept the least repayment risk, and typically have the most conservative lending criteria. Banks generally lend such debt in amounts greater than €50m, and senior debt will form a key part of telecom infrastructure financing.

The main sources of senior debt are:

- **Telecoms lenders:** essentially these are the relationship banks¹¹ for the larger telecoms operators whether, incumbents, cable operators or altnets. These banks will look towards the strength of their key telecom clients' balance sheets. However, as we have seen above, their clients have been unwilling to borrow for FTTH deployment as the current regulatory stimulus encourages them to continue to focus on their copper assets. Consequently, they have not been pushing their relationship banks to invest in this area. Our interviews suggest that relationship banks would apply their normal criteria to loans for fibre investment and have the capacity to lend. The most liquid part of this market is for lending over 5-7 years and generally these banks will prefer to avoid the longer tenors required by infrastructure projects.
- **Infrastructure project financiers:** As the name suggests, they fund infrastructure projects that require lending over long periods (perhaps up to 20 years). Some banks specialise in energy or other sectors but there are also generalist lenders already interested in fibre projects. We believe that this category of senior lenders will have a crucial role to play in the funding of FTTH projects provided that the structures presented to them include very little or no market risk. If a large number of attractive projects are available, then it is likely that new funds to specialise in telecom would be established by investment houses.
- **Multilateral Financiers:** These entities are few in number but are generally willing to lend long-term. Active across Europe are the European Investment Bank (EIB) and the European Bank for Reconstruction and Development (EBRD). There are also national or regional banks in some countries such as Caisse des Depots in France and kfw in Germany. Such banks are key players in the area of infrastructure finance due to their mandate to support infrastructure projects at national and supra-national levels and willingness to lend long-term. These financiers benefit from cheaper state funding, which they pass on to borrowers in the form of lower or fixed interest rates. However, these lenders tend to have very rigidly defined and rather conservative lending criteria, which must be satisfied for them to participate in a project finance. Nonetheless, if the market generally accepts structures showing acceptable levels of market risk, we expect that multilateral financiers will have a key role to play in facilitating them.

3.3.5 Corporate Bonds and Project Bonds

Corporate bonds are a form of security based on debt which must be repaid at maturity and they also generally pay an agreed interest coupon during the life of the bond. They are an important source of capital for larger businesses. The Corporate bond market is a large liquid market with bonds for rated companies traded at stock exchanges all over the world. Typically, investors in this market will be looking for low-risk investment. Trading volumes are typically in the trillions.

¹¹ See Glossary. The description relationship bank does not describe a special type of bank but refers to the bank that a company uses as its main bank and which provides most if not all of its banking services, accounts etc. Clearly, a large company will have regular communication and a 'relationship' with its main bank.

Project bonds are debt issued by projects rather than corporations so generally are higher risk and less liquid. We understand that the EU is currently planning a pilot project bond initiative in which selected projects will be credit-enhanced, most probably, by the inclusion of quasi-equity in the form of subordinated debt instruments from the European Investment Bank (EIB). What this means in simple terms is that the quasi-equity will provide a financial buffer for the project so that debt issued in the normal way by the project will have an acceptable risk profile. This senior debt can then be rated (and perhaps the debt from several projects pooled) so that it can be traded just like any other corporate bond thereby creating the potential to attract a large number of new investors, who do not currently participate as direct senior investors. In this way, a relatively small investment in high-risk quasi-equity could increase the total amount of funding available.

In our graphic above, we have included project bonds and shown the linkage between the bond and the quasi-equity as a dotted line.

3.3.6 Institutional Investors

The project bond initiative may give institutional investors such as pension funds, insurance companies and mutual funds a way of responding to calls for them to support long-term infrastructure deployment. A portfolio of well-structured FTTH Projects, with contractual (or otherwise supported) revenue streams should naturally attract institutional investors.

In the OECD area institutional investors held over US\$65 trillion at the end of 2009. They are increasingly coming under pressure to move away from shorter-term investments and become more active long-term as counter-cyclical investors and active shareholders. Governments in the OECD area are showing signs of a willingness to modify fiscal regulation so that institutional investors can take a more active part in supporting infrastructure build-out.

A correctly structured Fibre Switchover programme is likely to find support from such investors (through a variety of mechanisms including project bonds and PPPs) underlining our general point that here is plenty of finance available, provided the industry approaches the capital markets in the right way.

3.4 More than €250bn of Capital is Available Over Eight Years for Fibre

The financial system is large, complex and fluid with capital flowing to new classes of investment as they merge or between asset classes / markets depending on conditions. It is not possible therefore to provide a definitive estimate of the total capital potentially available for FTTH but all our research suggests it is potentially large and financiers are clear that, if the industry presents the right deals to the market, then they will get funded. The table below summarises our estimates of potential capacity.

Source	Typical Rate of Return	TOTAL 2013-2020 Capacity	Comment	Potential for FTTH
Venture Capital	>>25%	N/A	Unlikely to play much of a role. Return hurdles too high. Investment horizon too short.	-
Operator Gearing Up	12%-15%	€40-60bn ¹	Operators in recent years have de-leveraged - to a small degree this process could be reversed.	€35bn
Operator re-investment	12%-15%	- €240bn	We have analysed the industry, its cashflow and CAPEX norms taking account of only the wireline business and allowing for debt service. So far of course operators have not invested greatly in fibre deployment so there is a question of incentives as well as of capacity.	€120bn
Private Equity	10%-12%	€73bn ²	These funds have to focus on buying established businesses but not on funding major new developments. They offer an exit route for infrastructure investors so may have a role.	€7bn
Infrastructure Funds	10%-12%	€160bn ³	The section of Private Equity focussed upon infrastructure. Now likely to become more liquid as Pension funds and insurers begin to move into the infrastructure market.	€25bn
Project Financing	3%-5%	€800bn	Key component of liquidity increase. Avoids the problem of Operators' balance sheets filling with potentially low-performing assets.	€35bn
Corp. Bonds / Senior Debt (& Project Bonds)	3%-4%	€800 - 1,200bn ⁴	Will be accessed by telcos to fund themselves on balance sheet and by projects once they are mature and stable (or have been suitably credit enhanced).	€100bn
Blended TOTAL			These funding sources will likely be used in conjunction and the individual figures cannot simply be added together to get a grand total.	Circa €250bn

Table 2 Summary of Potential Private Sources of Capital for Fibre Investment

3.5 Structuring Public Support for FTTH Projects

Based on our analysis and financial modelling (see next section), we conclude that the public sector will be required to step in to defray the market risk, thereby releasing the latent capacity of the Capital Markets to finance these projects given:

- various public Authorities have demonstrated readiness to invest in Next Generation broadband access;
- the lack of investment by the private sector due in part to misaligned incentives as set out in section 1.

Hence we would argue that there is the need to structure FTTH projects as PPPs with the Government and a major operator as key stakeholders. We would further argue that a Public Authority should give support to the PPP Project as an on-going stream of Availability Payments, which would support debt repayments and potentially some part of investor returns.

3.5.1 Options for a Fibre PPP

In terms of providing such support, the Joint Venture structure would be our favoured approach as it allows for a flexible regime in terms of asset ownership, which may become a key issue in aligning the interests of the public and private sectors. We will set out this vision in more detail below. However, there are a number of variants to this structure that should be considered in order to allow for optimal risk transfer, and to meet the objectives of all parties.

Our favoured structure lies in this area and could be adapted to meet the needs of the major stakeholders.

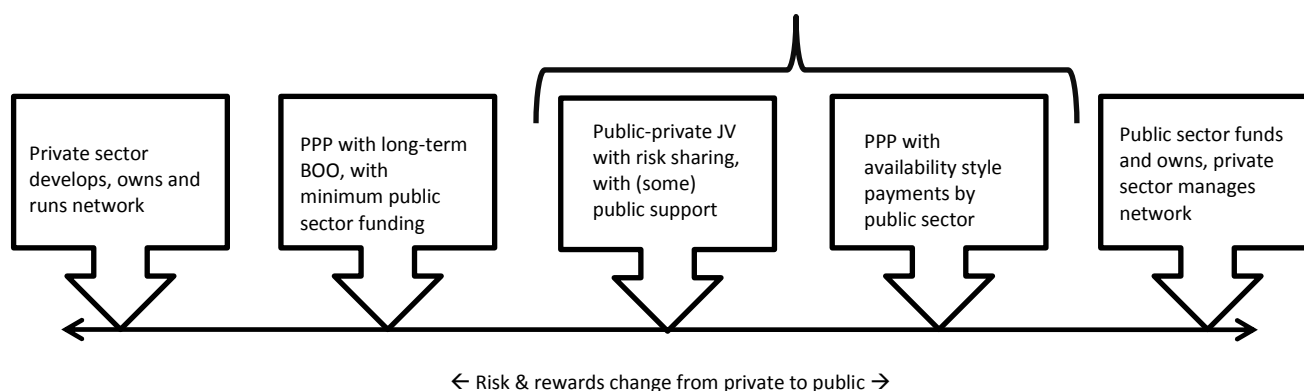


Figure 20 PPP Structures Showing Public Private Risk Allocations Source: Portland Advisors, Ventura Team

Whilst these options first and foremost represent a range of risk sharing options, they also generate varying levels of Financing Stimulus and accounting and other possibilities. They offer varying options in relation to asset ownership; and they drive certain behaviours in terms of ownership separation. We discuss the major outcomes in these areas as follows:

- **Private Sector Owns and Runs the Network:** Clearly, this option represents the least change from the current situation. Although the economics of FTTH seem to be improving as retail customers are increasingly adopting more bandwidth hungry services such as on-demand IPTV, there remains the problem of the fundamentally uneconomic situation of delivering such services to suburban and rural areas. Doing nothing would simply exacerbate the already apparent digital divide between the urban and rural areas.

- **Long term “Build, Own & Operate” (BOO) with minimal Public Sector funding:** In this situation we envisage that public sector funding would be a direct grant to the operator. This would leave the operator taking a majority of the market risk. An up-front grant, if it were to be enough to service the required debt, would probably result in prohibitively high levels of State Aid, which, in Europe would likely result in difficulties with clearance at the EU level. This structure was employed in Singapore which enjoys much lower levels of market risk due to it being a very wealthy city-state, with very high levels of population density in multiple dwelling units, and where the Authority was able to force SingTel into structural separation. None of these factors could be said to apply to Europe as a whole.
- **Public Private JV / PPP with Availability Payments:** Although shown above as two separate options, our favoured option is a blend of these structures with the Regional/National Authority forming a JV with a major operator with each party injecting equity (as a stream of Availability Payments) and assets respectively. The new NetCo thus formed would provide wholesale services on an open access basis. One major benefit of such a structure is that it allows for a more flexible regime in terms of asset ownership, and could allow for the participation of Private Equity as a way of compensating the operator of putting in its assets, and as a way of distributing ownership to keep the NetCo off the Governments’ balance sheet. The JV agreement might also include a call option for the Operator allowing it to take back the assets after some years either at a pre-agreed price or according to a price determined by a formula.
- **Public Sector Owns & Private Sector Manages:** In this scenario the public sector, as the new owner would clearly have nationalized the wholesale network, and imposed structural separation on the Operator, which we feel could be politically troublesome. For that reason we are less in favour of this structure.

3.5.2 Our Preferred PPP Structure Blends Long-Term and Medium-Term Finance

The diagram below illustrates the contractual and financial relationships between the stakeholders in our preferred structure. The rationale behind this structure is the need to defray market or revenue risk.

The authority and its operator partner in the Joint Venture have, between them, the greatest ability to achieve this through a mix of intelligent design and build, re-using existing telecom assets where available, and accessing useful public assets such as sewers, ducts or waterways where possible. The participation of the authority will both create a favourable local planning environment and potentially bring in large public sector bodies such as schools and hospitals as users of the network.

The combination of an operator contracted as an anchor tenant on a take-or-pay basis and the potential for public sector support in the form of availability payments together will generate the sort of predictable cashflow that infrastructure financiers demand, and will release the latent capacity of these financing markets.

We set forth an outline of such a PPP structure below:

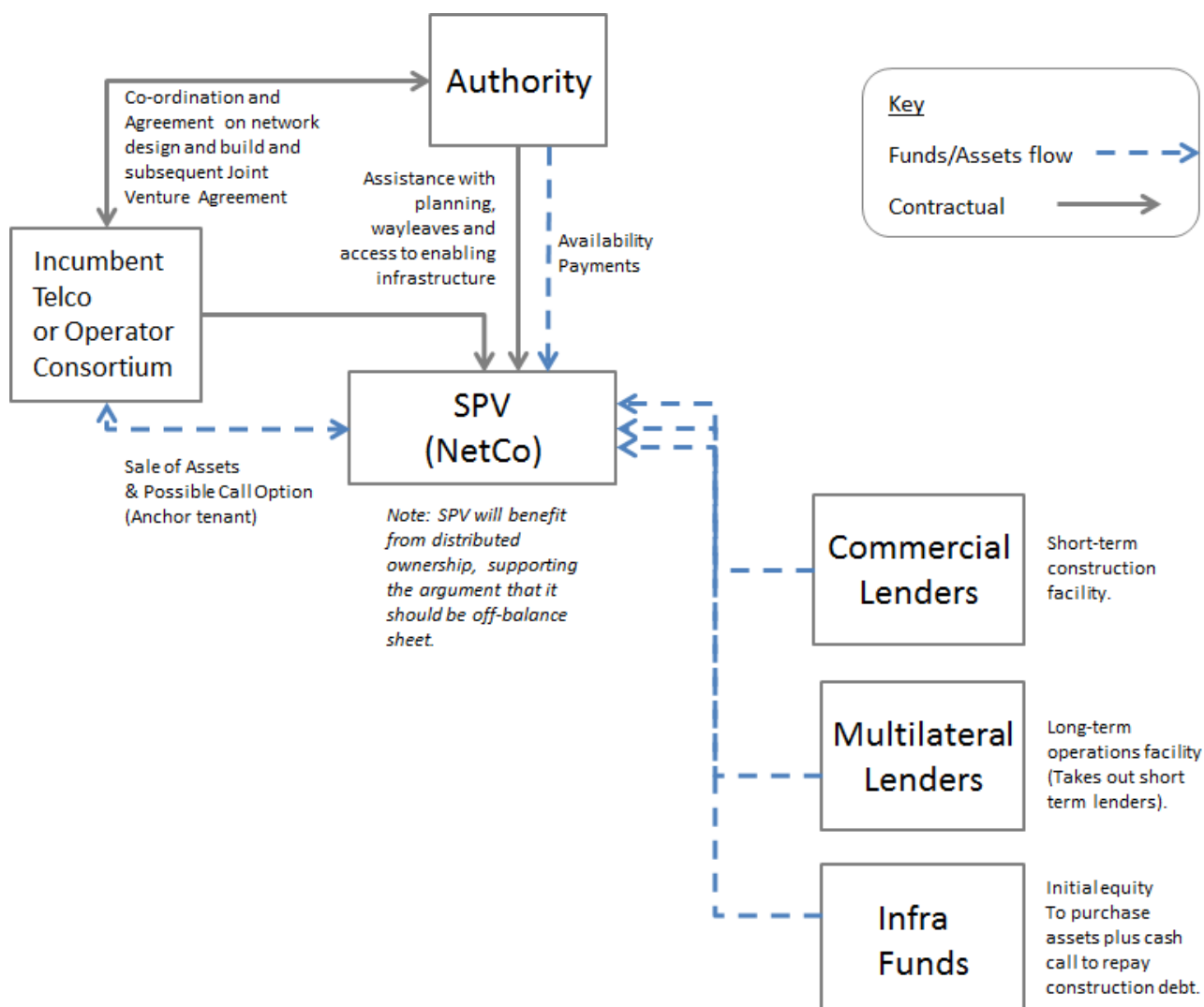


Figure 21 Preferred Structure for a Fibre Infrastructure Public-Private Deal

National scale projects pose their own risks arising from complexity. Rather than 27 national scale projects we envisage that, if operators (or consortia of operators) chose to use off-balance sheet financing, then this will be on a discrete project-by-project basis and that many of these projects will have Regional Authorities as major project sponsors. This has been the case for the PPP Projects closed to date.

The optimal size for such projects would be in the region of €200m to €500m - making them interesting to senior lenders and Private Equity funds, whilst being at a manageable size for due diligence purposes.

In our view, national programmes would likely get bogged down as a result of the complexity of scale (as seems to be the case with the NBN in Australia) as well as inter-regional politics.

3.5.3 Benefits for the Operator(s) of a PPP Structure

We have considered a structure in which the Operator would contribute network assets, into a Special Purpose Vehicle; the copper network would then be turned off and replaced with a fibre optic access

network upon which the operator would be the anchor tenant. The SPV would borrow the money necessary to fund the upgrade, which would later be repaid from cashflows generated by the SPV. This structure could be arranged so as to present the following benefits to the Operator as a stakeholder:

- Funding the Fibre Switchover off-balance sheet benefits the operator because it does not strain their balance sheet and should not alienate their shareholders. Taking on large debts to renew the access network would increase the risk of the company and probably result in a ratings agency downgrade for the telco. Moving the obligation to finance such a large CAPEX programme to an SPV puts that risk elsewhere. The telco can continue to pay dividends and enjoy its current credit rating.
- The Operator will need to rent the network from the SPV and the net effect of such a re-structuring will probably be to increase the operating costs of the telco for a period before the efficiency gains of an all fibre network can be realised. In this interim period, the cashflow impact on the telco can be minimised - or perhaps negated - by compensation paid for its assets transferred (i.e. sold) to the SPV. This arrangement protects the telco from liability for a major CAPEX programme and protects its operating cashflow in the period before the programme is completed. They therefore enjoy the benefits of a new infrastructure while shedding what many analysts consider to be low performing assets.
- In the long-term, after the switchover has been completed and the SPV has paid back all or most of its debt, then the operator or consortium of operators would most likely want to take ownership of the assets back. The terms of the JV between the Operator and the Authority could allow for the Operator to have a call option over the assets it previously sold into the SPV. The call option would most likely set a price defined in terms of a formula so both sides have certainty (within the bounds of variables like inflation). Such arrangements would effectively make the SPV a BOT (Build, Operate, Transfer) operation. The Operator may want exercise this option in the event that it feels that no flight of capital will occur if it were to re-consolidate the upgraded assets back on to its balance sheet. Financiers of the SPV would welcome such a 'ready made' exit route.

3.5.4 The Roles of Operators and Other Parties in Such a Project

Whilst the structure above does involve a number of stakeholders, we feel that their interests should be, and can be, properly aligned. The roles they will play and their financing impact is as follows:

Stakeholder	(Potential) Role(s)	Financing Impact
Operator(s) (incumbent alone or incumbent and/or consortium of altnets)	To design and build the network. Where the operator has a wholesale unit, to light the fibre and offer service to retail service providers. To be an anchor tenant on the network. To be a key contributor to corporate governance at board level in the JV.	The financiers will look to the operator to have majority voting rights in the JV relating to operational matters. Likely to expect that the Operator(s) will have a call option over the assets in the JV as this could provide an exit for the financiers.
Regional Government / Authority	To assist in the design/build of the network through administrative measures, and to provide clarity on planning issues.	The key element in attracting financing will be defraying market risk through an on-going subsidy structured as payment for the delivery of certain outputs. The Public Sector is best placed to play this role.

Stakeholder	(Potential) Role(s)	Financing Impact
National Regulatory Authority	Give long-term clarity and stability in wholesale pricing (and strategic management of copper v fibre pricing). They provide these in exchange for delivery of numerous Fibre Switchover projects.	Long-term pricing clarity will be attractive to the operator(s) in the Joint Venture, and will also provide clarity on equity returns or debt coverage for the financiers
Infrastructure Funds	These are key investors. They will subscribe equity to the SPV, which will be leveraged with debt. The equity cushion they provide is crucial. They will require a substantial minority shareholding in the SPV in return for their investment, and will participate in corporate Governance.	A skilled Infrastructure specialist fund will play a role at board level, and the fact that it is a co-owner with the operator(s) and the authority will assist in supporting the argument that the whole JV should be off-balance sheet, if such treatment is required.
Multilateral Lenders & National Financing Institutions	To provide long-term loans to finance the on-going operations. In general, we think this is the best use of these banks as short term construction finance can be obtained from commercial / relationship banks.	These entities will likely have an infrastructure mandate, especially for their own territory. We would expect these funders to play a key role in any state-supported structure.
Project Financing Banks	In some cases they will be the relationship banks, but will potentially be better suited to analysing a structured cashflow project.	These banks will be very important to attract to the FTTH projects. We include them here to demonstrate the range of senior debt sources that could be available for a well-structured project.
Commercial / Relationship Banks	These funders may play a variety of roles, but we envisage if there is to be a tranche of construction financing, these banks are most likely to be able to service this.	In order to maximize liquidity, we envisage that a tranche of medium-term debt might be attractive to these banks, some of which will likely also have Project Financing capability.
Equipment Vendors	Provide turn-key construction services and perhaps also design, outsourcing or managed services to the SPV. If the SPV also provides wholesale services using active equipment clearly vendors will supply that technology and may to some degree help finance the purchase of the equipment.	Equipment vendors may have a crucial role to play in a number of areas in the new NetCo depending upon its structure and the requirements of the Operator consortium. The inclusion of a reputable equipment vendor will assist in defraying technical risk, and so help in securing funding.

Table 3 Potential Roles in a Fibre Infrastructure Project

3.5.5 Asset Ownership in the Special Purpose Vehicle (SPV)

In order to “ring fence” the project cashflows and assets, the senior debt financiers will likely require that the operator (or consortium of operators), sell their assets into the SPV. This has the added advantage of removing the borrowing in the SPV from the operator(s) balance sheet. Our preferred structure for securing debt financing in the project vehicle would be to structure this as a JV between the operator(s) and the public sector. Doing so allows for tailored corporate governance, thus ensuring that the operators maintain their required level of control over the network, and also allowing for a call, (or a series) of call options by the operator(s), so that it/they can be sure that they will, in the long-term, maintain ownership of these core assets. In short, they will have the option to buy back the assets when the financing “trough” of debt has been mainly paid off.

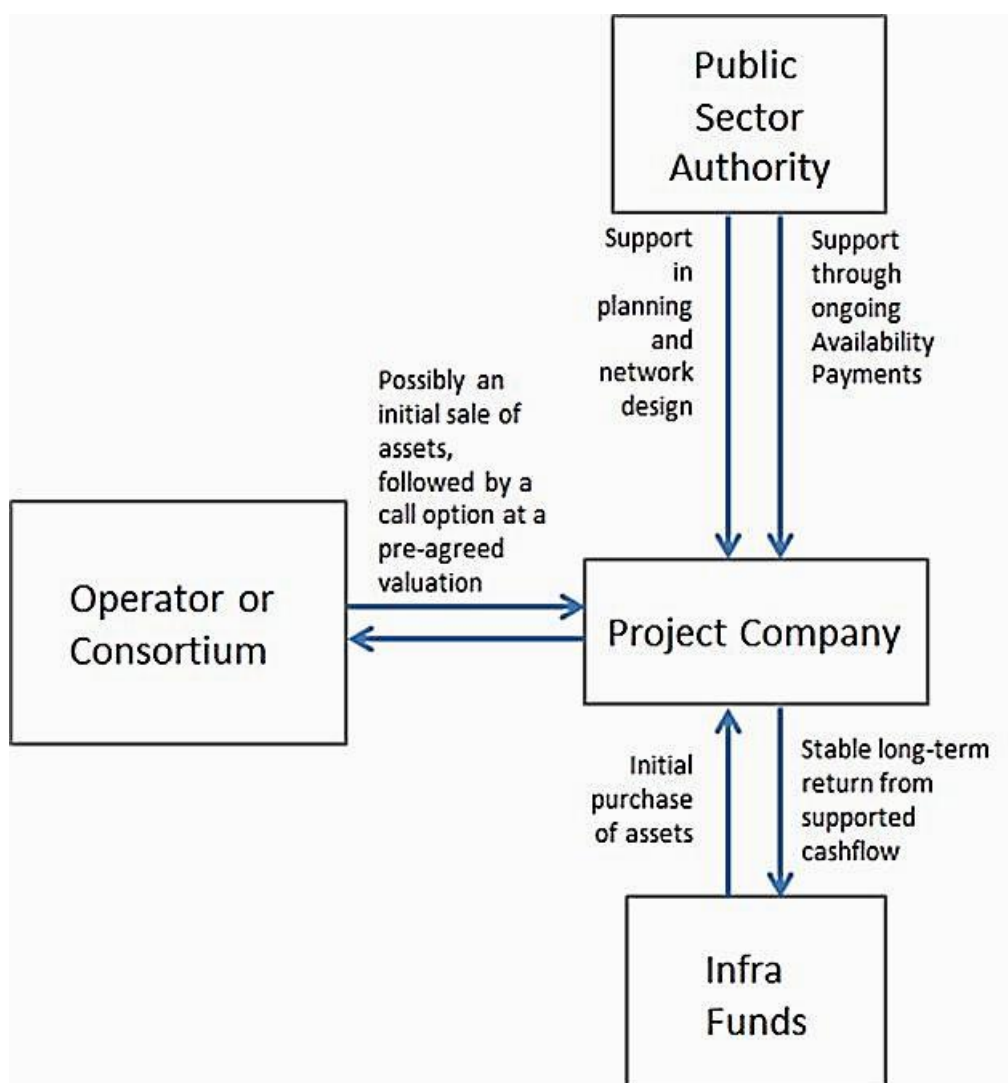


Figure 22 Ownership of, and Major Roles in, the Intervention Project

3.5.6 Why Availability Payments are a Better Mechanism than Grant Funding / Procurement

We believe that structuring Public Authority support as availability payments rather than a grant, will generally be beneficial for both the Authority and for the project it is sponsoring for the following reasons:

- 1) In a “Traditional Procurement” scenario, the costs to the taxpayer are all front-loaded, which is a dynamic that Public Authorities may seek to avoid in these times of financial crisis. Depending upon the accounting for such payments, Authorities may prefer the fact that they pay an annuity, which may be accounted for as operating payments rather than capital expenditure.
- 2) In addition, such a payment stream will most likely have a lower Net Present Value (NPV) than a front-loaded grant scheme. This is a feature of PPP schemes – although the total amount of money paid of time will be larger than a single upfront grant to achieve the same effect, the NPV will be lower. In general, it is easier for Governments to fund a series of smaller payments than a single much larger payment which – to have the same stimulus effect – would have to be paid before anything is built (so is also more risky).
- 3) Availability payments will only begin once the network is available - meaning that the Authority is exposed to much less construction related risk.
- 4) The on-going nature of the Availability Payments supports debt repayments and binds in the stakeholders more firmly during the operations phase as all the stakeholders will have a united interest in seeing that the Key Performance Indicators (KPIs), and hence the Availability payments continue to be met and paid.
- 5) For a project generating increasing revenue, Availability Payments can be sculpted such that they will operate as a top-up between the revenue and the amount required to service debt.

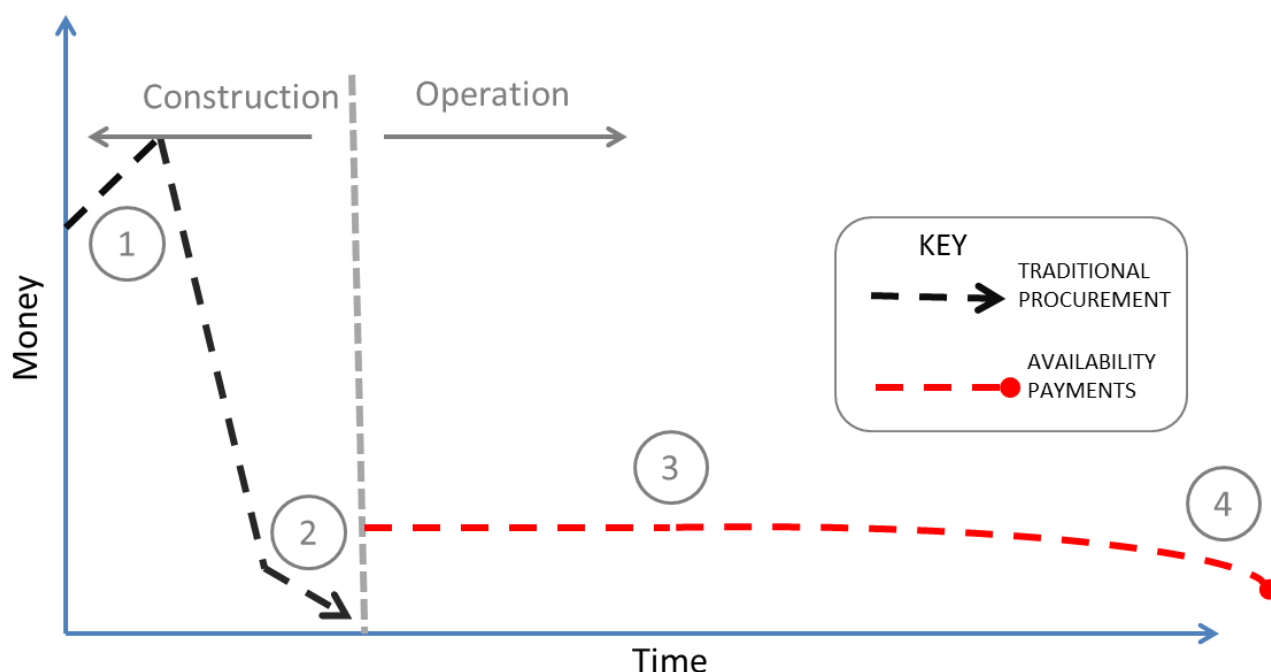


Figure 23 Grant Funding versus Availability Payments: Cashflow Dynamics Compared

There are also serious practical flaws with procurement in the context of FTTH interventions which we have experienced first-hand. The process requires a precise crystallised requirement early in the process and this

is completely unsuitable for what is really a complex business deal. Furthermore, the idea of “buying” an output rather than creating a partnership of investors means that in reality there is no competition in supply – the complete opposite of what a procurement process is presumably intended to create. **Quite simply Public Sector Procurement is the wrong tool for the job.**

3.5.7 PPPs and Project Bonds are Complementary

The PPP approach and project bonds both address the same issue of reducing risk to make a project bankable but they do so in different ways. It is not common practice but there is no reason why both techniques could not be used in the same project to complement each other. Using both tactics in a single project would slightly increase complexity but reduce the absolute amount support required from each of the relevant parties, which are:

- the provider of quasi equity to cushion the bond;
- the Government Authority committing to make availability payments.

The diagram below compares the two approaches.

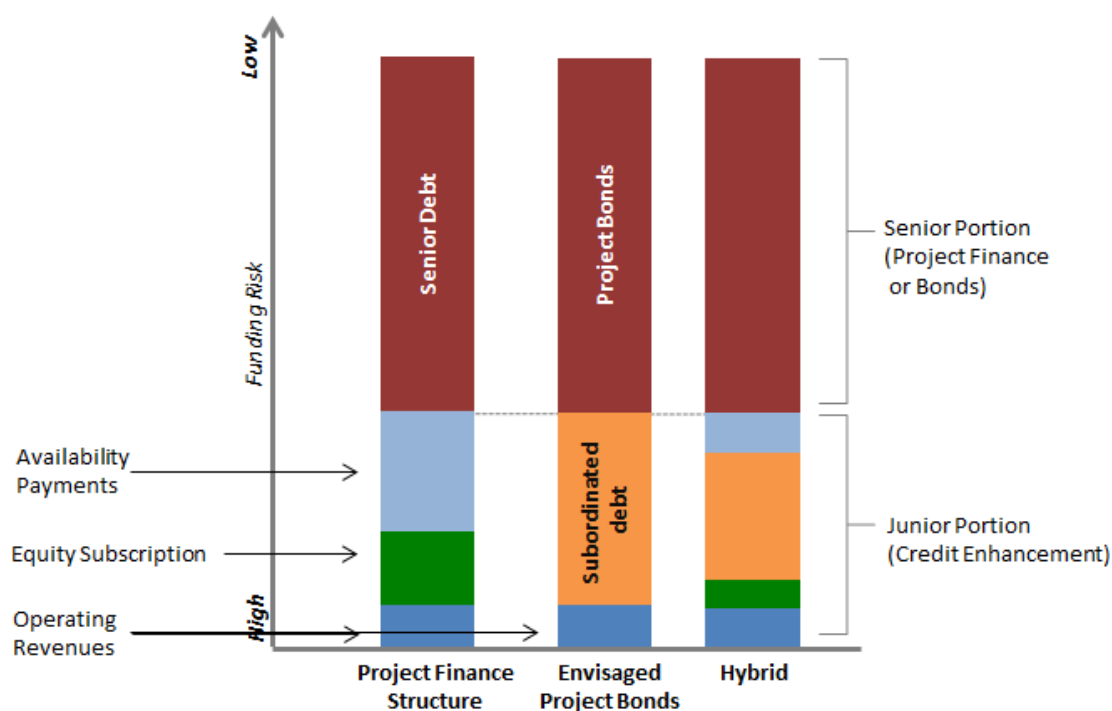


Figure 24 Comparison of Financial Structures - PPP Project Finance and Project Bonds

The two approaches are complementary. The project bond approach relies on sufficient quasi-equity in the form of subordinated debt (aka mezzanine debt) being provided by one or more institutions that are prepared to take such risks. For example, the CEF anticipates that the EIB will provide such subordinated debt. In contrast, the PPP approach fits the approach of an established set of project financing and infrastructure investors. Both approaches could be used in parallel in order to tap the widest possible base of investors and could even both be employed in a single project.

3.6 Telco Shareholder Reaction to the Fibre Switchover

It is vital, of course, that changes in the strategy and regulation of telcos maintain the support of shareholders whether they are investors in altnets or incumbents. In our view, based on examples the proposed approach to off-balance sheet financing and indeed the general programme of regulatory change, should generally benefit telco shareholders whether incumbent or altnet.

We have not been able to research the impact on altnets in detail but we have examined the fibre programmes in New Zealand and Australia and their impact on incumbent share prices.

In New Zealand the Government launched its UFB (Ultra-Fast Broadband) programme to promote fibre investment. In order to win various regional NetCo style contracts the incumbent telecom New Zealand decided to split out the access network in to a new company called Chorus. This process was completed last year (2011). It provides a real-world proxy for the type of re-organisation we envisage albeit an extreme form – there is no need in our view to undertake a complete national change to this extent.

The graphic below illustrates the change in corporate structure when the access business was split out in to a new entity (Chorus). At the end of November 2011 shareholders in Telecom New Zealand received one share in Chorus for every five shares owned in TCNZ. Chorus de-merged from TCNZ taking the fixed local loop – and about 40% of the balance sheet – in to the new company. Chorus is now listed separately on the New Zealand and Australian exchanges.



Figure 25 TCNZ Share Price Before and De-Merger of Chorus (CNU) – 5 Day and 2 Year Views

Source: Google Finance

The first chart shows the stock split – one new CNU share for each 5 TCNZ shares upon which the TCNZ price fell around 20% exactly as to be expected. Over the period since then those shares have recovered that fall as shown in the second chart (in line with the local market) and Chorus has also risen slightly. Overall shareholders are ahead therefore approximately 17% better off compared to if the split had not happened and TCNZ simply rose with the market. The fact that 99.8% of shareholders voted for the de-merger would suggest they believed it to be a good thing for the value of their holdings. A TCNZ investor presentation reports that total TCNZ total shareholder returns (TSR) were 37% over the 12 months up to 23rd Feb 2012. This is a high TSR for any mature telco to achieve.

In Australia the process is different: there was no stock split of Telstra – instead the company is passing its access network over to the Government owned NBN company area by area in return for compensation. Ultimately Telstra will be a service provider over an open shared utility much as we envisage for the grey-white areas of Europe. The NBN project started after the 2007 election and the long-term share price of Telstra compared to the index is shown below. Since early 2007, Telstra is up ~20% compared to the local index of the top 200 stocks.



Figure 26 Telstra (blue) Compared to the ASX200 Index (red) Source: Google Finance

4 Financial Modelling of the Fibre Switchover

We have created a financial model of the fixed telecom sector to test the overall financial profile of the Fibre Switchover. The model represents all EU27 fixed operators as one excluding an assumed 40% market share in black areas taken by CATV / business altnets. The model of “EuroTelco” therefore represents the aggregate of the fixed line incumbents and those altnets that rely on their infrastructure for the provision of competitive services.

The model indicates the magnitude of financing required for the Fibre Switchover and the proportion of that financing that would need to come from the taxpayer. By varying pricing and speed of switchover we can test various scenarios for financing.

4.1 Introduction

The model represents a theoretical pan-European operation that is the aggregate of all telco operators and service providers that use telco infrastructure. As such, it represents an amalgam of all incumbents and altnets throughout Europe, driven by average assumptions in relation to operating margins and dividend policy. These are taken from the average values shown in published results for the EU27 incumbents but modified as explained previously to represent the fixed network only.

The model is split into four sections as shown in the diagram below. The model is structured in this way so we can evaluate the financing needed to renew the passive infrastructure in the grey/white areas and the level of public sector support that will require. In effect this models a large aggregate SPV being created in 2013 and taking these assets over. In reality of course we imagine a series of regional (i.e. sub-national) projects starting over some years. Note: we assume that the telcos themselves fund the Fibre Switchover in the black areas over the same period and this CAPEX is, of course, included in the financial model.

For the financial statements and results, the active layers and black area passive are consolidated in to single “EuroTelco” and the financials of the fourth unit – shown below highlighted in red – are modelled separately. This “NetCo” represents the grey/white passive networks that will be the focus for Government intervention. The diagram below illustrates the structure of the model.

Unless otherwise stated, the result shown in the section are for a 12 year switchover and assume a 15 year weighted average debt tenor (i.e. period over which debt must be repaid). For NetCo’s cost of capital, we assume an all-in cost of 3.5% throughout for senior debt and for equity a return of 10% pa.

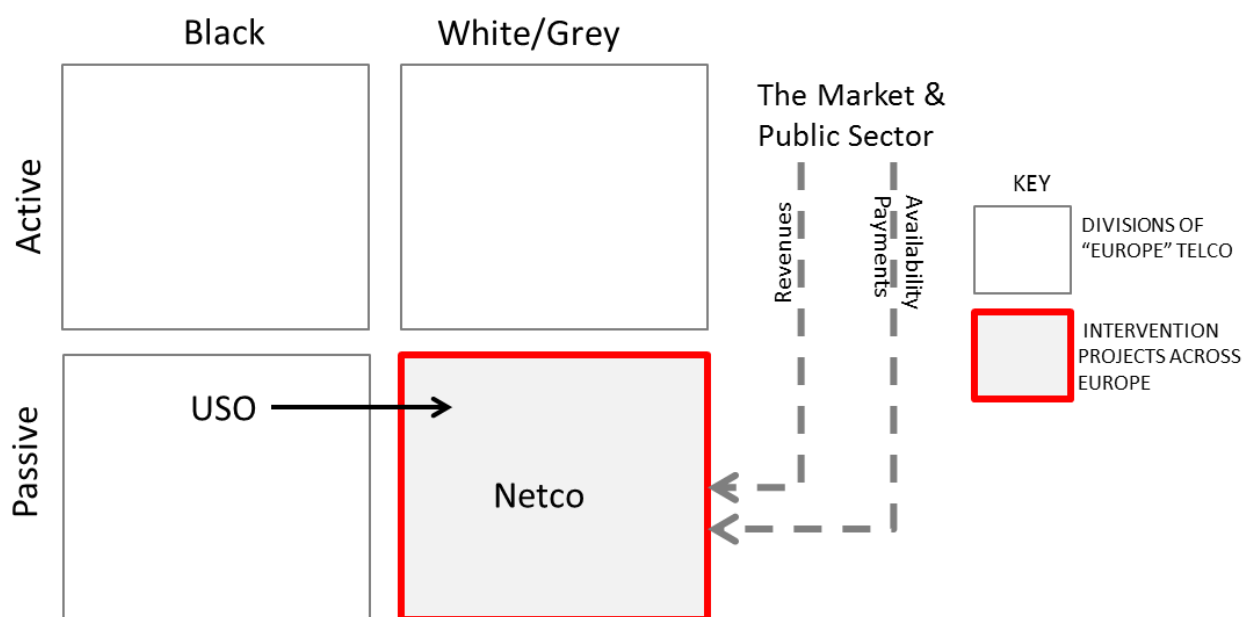


Figure 27 Structure of the EuroTelco High Level Financial Model

4.2 Key Assumptions

4.2.1 Basic Assumptions

We adopted the following major assumptions which were benchmarked against EU announcements, the FTTH Council's own research and the published financial results of EU27 incumbent telcos and altnets:

- We assumed 220.5m premises to connect throughout Europe, with 45% of these falling into the black area as defined by the EC.
- The EU reports a figure for total 2010 fixed sector revenues of €145 billion – we reduced this by 10% to reflect current economic conditions and then removed a proportion for cable TV operators.
- We assumed that cable TV operators have 40% market share throughout the black areas and of course, by definition, zero presence in the grey/white areas.
- The model is in nominal terms and based on 1.5% p.a. inflation throughout the period.
- Effective cash tax rates for European incumbents in 2011 ranged from zero to over 60% of profits. There is no meaningful average tax position so we excluded this from our calculations.

We derived our assumptions for the average capital cost from the recent FTTH Council study. The overall total CAPEX for a complete switchover, as explained in section 1.2, is estimated at €260 billion and although the cost varies greatly (reaching up to €7,000 per home in the FTTH Council study) the average cost per premise across the EU27 used in the model is as follows:

<i>Unit Capital Cost in € per premise</i>	Black Areas	Grey/White Areas
Active	147	147
Passive	491	1589
Total	637	1735

Table 4 EU27 AVERAGE Unit Capital Costs for FTTH. (Source: FTTH Council)

4.2.2 Telco Dividends

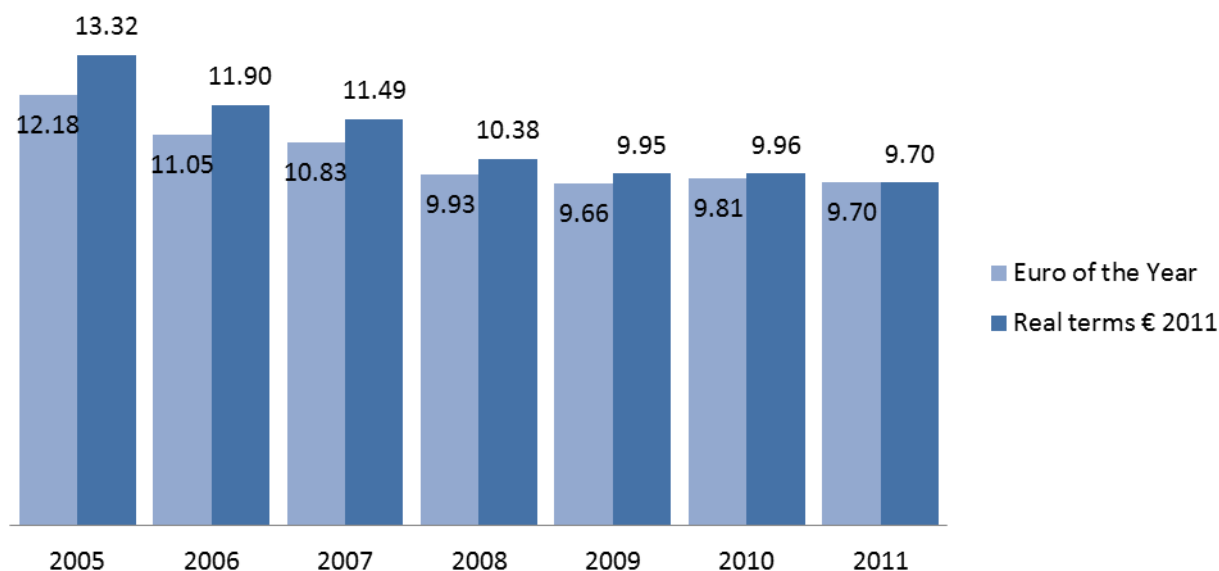
We forced dividends in the model to start at the estimated current aggregate level (€8 billion pa) and to rise in line with inflation. This level of dividends matches current average listed incumbent behaviour assuming the same relative pay-out ratio for fixed as for the fixed+mobile integrated groups. Dividends reach €9.1 billion in 2020 and the cumulative dividend paid out over the seventeen years of the model is €156 billion.

At this level dividends could more or less finance the low CAPEX case for the Fibre Switchover but we have taken these as non-discretionary and assumed that maintaining such dividends in real terms are an absolute requirement.

4.2.3 Wholesale Pricing Assumptions

The closest proxy in terms of current regulated prices that we have for a physical fibre access is that for an unbundled copper pair local loop. Regulators have developed local loop cost models – some of them of enormous complexity – in order to determine the regulated tariffs for unbundled local loops. In the financial model we assume that these regulated prices are also used for internal transfer pricing between passive and active layer business units of EuroTelco.

The maturity of the LLU pricing process seems to vary between countries. In recent years some national regulators raised regulated prices (presumably as labour costs and copper prices rose and, perhaps, asset utilisation fell¹²) whereas in others the regulated price fell in the most recent periods for which we have data. Overall, the average price seems to be stabilising as the chart below shows - although in real terms the average price has fallen almost 30% over the last six years. Presumably as replacement labour costs rise over time, the charge should also start to rise but there are clearly many factors at work in the regulators' calculations.



¹² Where regulated operator fixed lines are falling in number perhaps because of competition for cable and mobile then clearly average utilisation will also fall pushing up the average unit cost.

Figure 28 In Real Terms Average LLU Prices Fell 27% 2005-2011Source: Digital Agenda Scoreboard 2011, Assuming 1.5% pa Inflation¹³

Note: In this chart, Euro of the Year means the price in Euros at the time whereas by real terms we mean adjusted for inflation and stated in 2012 Euros.¹⁴

This simple average masks a great degree of variation between Member States. The pattern of variation cannot easily be explained by labour costs (which would dominate both the cost of construction and repairs & maintenance of this passive asset), at least as measured in the official statistics for gross earnings.

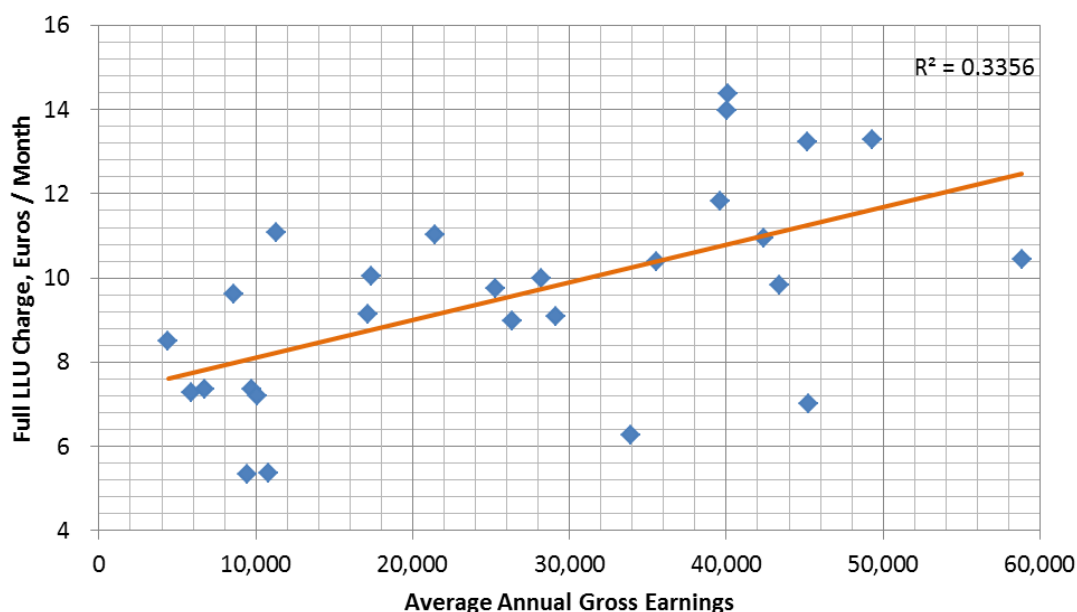


Figure 29 There is Only a Weak Relationship between Labour Costs (as Measured by Current Average Earnings) and LLU Charges. Sources: Digital Agenda Europe (LLU) and Eurostat (Earnings)

This correlation is weak and the standard deviation is €2.42 or around 25% of the average value.¹⁵ Clearly, there are many specific factors and perhaps differences in approach that complicate the picture.

For copper access we have used the DAE published average of €9.70 per month as the rental fee for passive access and increased this by 25% over 6 years in real terms restoring most of the recent cuts. For fibre access, we start the wholesale price at €9.70 and the increase by less so that after 6 years the price is 15% lower than for copper. Increased copper prices help fund the switchover. If such a strategic approach were taken in practice, such a copper pricing concession should be given over a long period on a transparent published contractual basis in return for specified delivery of the Fibre Switchover (as per Recommendation 1).

¹³ For a chart of Eurozone inflation over time compared to other major trading blocks see

<http://product.datastream.com/economics/gateway.aspx?guid=42e6908f-c57e-4257-9003-b9d8a57de53e&chartname=Core%20inflation&groupname=UK&date=20111116&owner=XRTN047&action=REFRESH>

¹⁴ With inflation, one Euro today is worth slightly less than a Euro of five years ago. To put a price from the past in today's money we need to adjust for inflation and this means the historical price will be higher – because €1 today is worth less than €1 of five years ago.

¹⁵ Although the relationship is not strong for the reader's interest twenty out of the 27 States are within one standard deviation. Those with a higher than expected charge are SE, FI, CZ; those with lower than expected monthly charge are NL, AT, SK, PL.

4.2.4 Income Support (USO) for the Grey-White Areas FTTH

The model is able to include a USO payment from the CATV industry to the new FTTH projects. We included an arbitrary assumption of a 50 Euro cent per month levy from 2013, which rises with inflation. At this level the contribution from CATV to the grey-white area renewal is around €3 billion each year and €38 billion over a 12 year switchover period – a significant contribution.

4.2.5 Compensation for Purchase of Grey-White Assets

Over the period of the switchover, compensation is paid by NetCo to EuroTelco for the purchase of its copper network in the grey/white areas. These payments have the following characteristics:

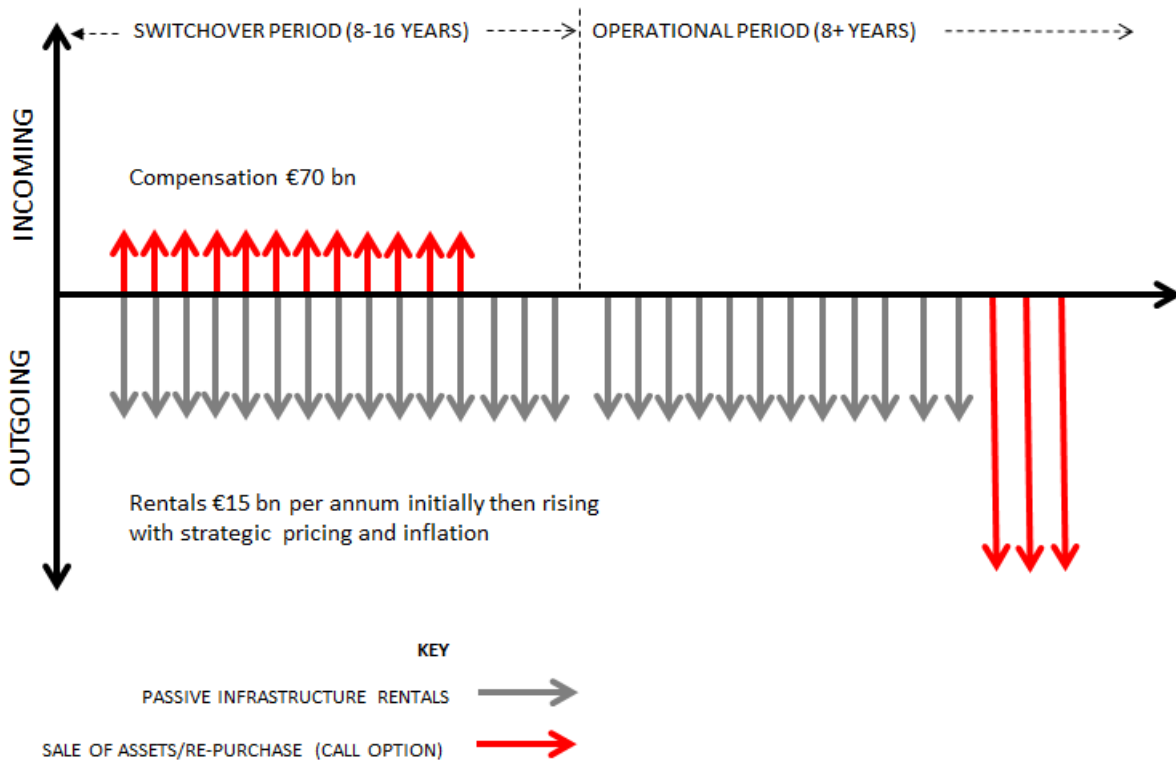
- The Present Value (PV) in 2013 of these payments equates to €776 per premise in the grey/white areas;
- €70 billion is paid in total over the period phased in time with the progress of the Switchover.

The PV per premise is just under half the estimated CAPEX for fibre. It's unclear what the accountancy concept of fair value might imply for such obsolete yet still serviceable assets but this figure does not seem unreasonable to us despite having been calculated by the logic of availability payments. It also happens to be roughly the same proportion as the New Zealand Government's share of their Ultra-Fast Broadband initiative if that programme were to drive a complete switchover.

4.2.6 Summary Timeline of Major Financial Events

The diagram below shows the rough timing and magnitude of monetary flows that we envisage during the switchover period and the period afterwards.

EuroTelco View



NetCo View (in reality we envisage perhaps ~100 regional projects rather than a few national scale deals)

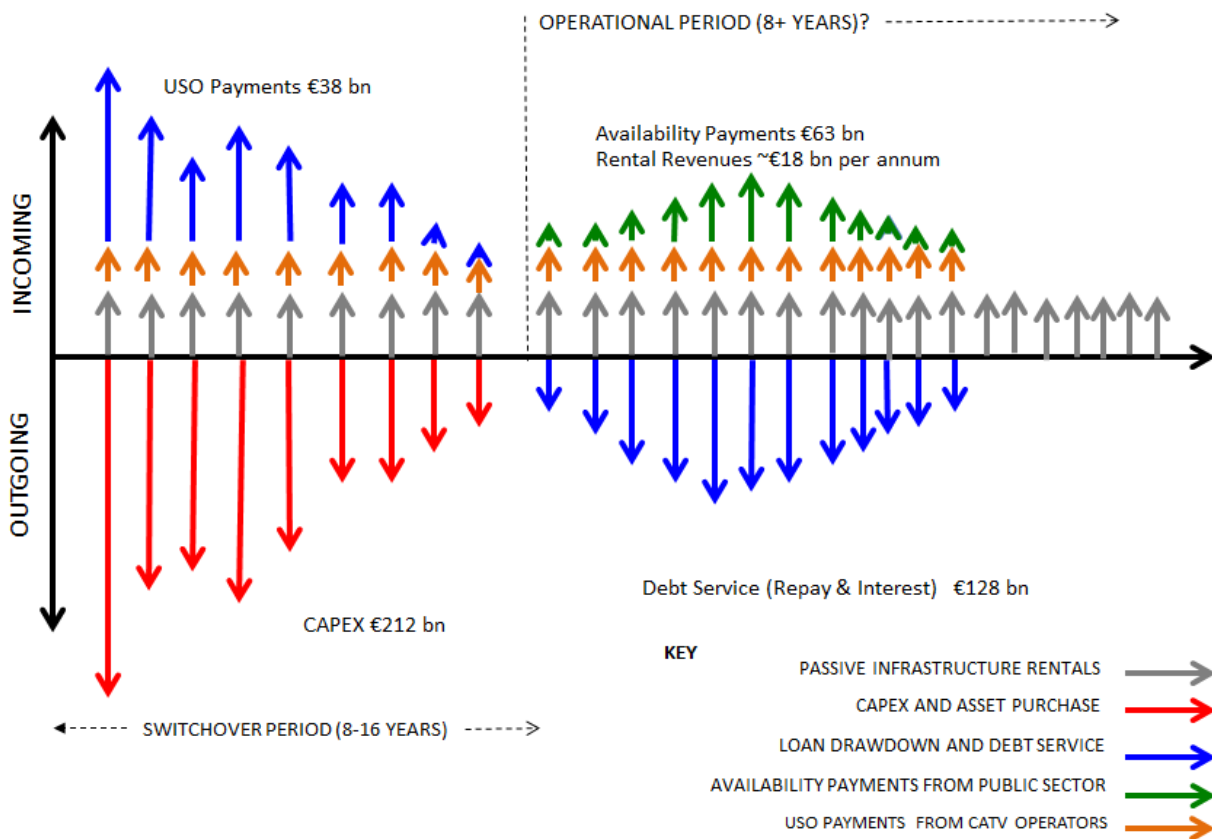


Figure 30 Major Financial Flows

4.3 Modelling Results for the “EuroTelco” Base Case

We built the financial model to estimate the level of investment, financing and public sector support for financing that would be required depending on variation in the rate and timing of the Switchover.

Regarding timing and rate of switchover, we were driven in the first instance by the DAE policy goal so we tested eight years (2013-2020) to meet the 2020 target. It quickly became apparent that by stretching out the Fibre Switchover it would be possible to reduce substantially the levels of public sector support required to support debt service through availability payments. In the end, we tested three scenarios selected on the following pragmatic basis:

8 Years	Matches the 2020 deadline. We feel that this is a challenging target and, unsurprisingly, turns out to require the most public sector support.
12 Years	At this duration, public sector contributions begin to fall dramatically.
16 years	We selected this duration because at this slower rate of switchover in the low CAPEX case no public sector support was required at all.

Table 5 Switchover Durations Modelled – All Start in 2013 in the Model

Please note that our calculation of the access network refresh cycle based upon regulatory depreciation rates (3.8%) gives an implied refresh cycle of 26 years.

4.3.1 Annual Cashflow Results

We show here the results for the 12 year Switchover case. The chart below shows the projected cashflow for EuroTelco and the aggregate NetCo. We have set a phased compensation payment from NetCo to EuroTelco totalling €70 billion over the period in order to enable EuroTelco to continue paying dividends increasing in line with inflation.

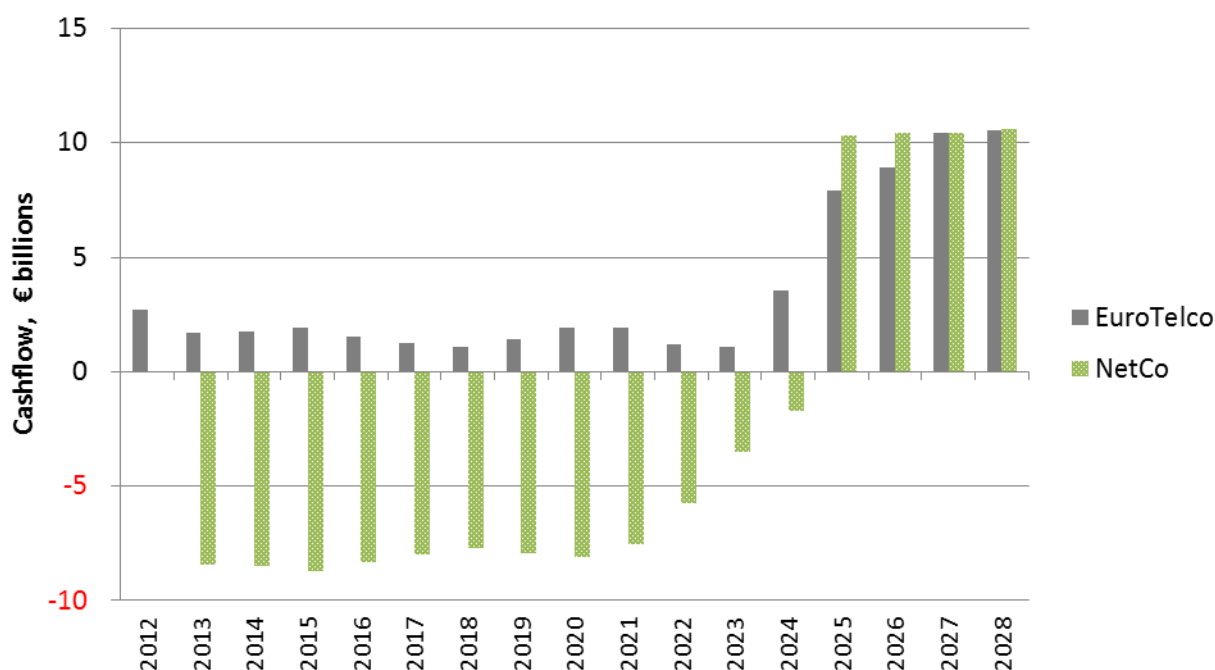


Figure 31 Projected Annual Cashflows – 12 Year Case.

We realise the ramp-up and ramp-downs in fibre deployment and capital investment are too rapid to be realistic – that is not the point of the model. We are testing the overall feasibility of financing and the level of taxpayer support required.

Despite a net increase in operating costs (resulting from the need to pay NetCo rentals) we project a reasonably sustained overall level of cashflow because NetCo pays phased compensation to EuroTelco for the purchase of grey/white area passive network assets. This largely offsets the increased operating costs. When the Fibre Switchover is complete and compensation payments stop, the efficiency gain from the switchover boosts operating cashflow considerably. In reality, of course, the same net effect could either be generated by additional revenues from new services or, more likely, by a combination of both new revenues and opex savings.

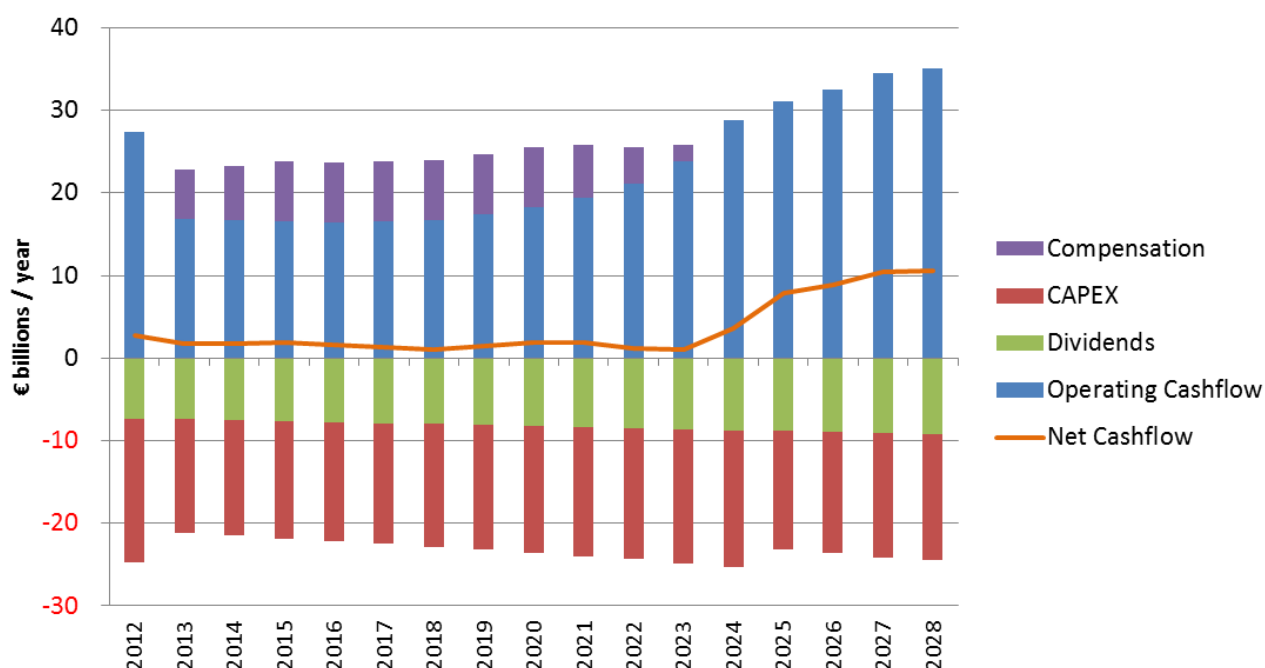


Figure 32 Components of EuroTelco Cashflow: Compensation for Asset Purchase Largely Offsets Increased Operating Costs Resulting from the Rentals Paid to NetCo.

Notice that after the Switchover is complete, the combined effect of operating cost savings¹⁶ and CAPEX falling back to background levels (16% of sales) result in a major uptick in annual cashflow. Although these numbers seem large they must be seen in the context of EuroTelco's annual retail revenue which has grown with inflation to ~€135 billion pa by that time. These cashflows are of course highly influenced by the level of CAPEX. This is shown in the next chart.

¹⁶ For which we only assumed the minimum 15% saving mentioned in operator interviews.

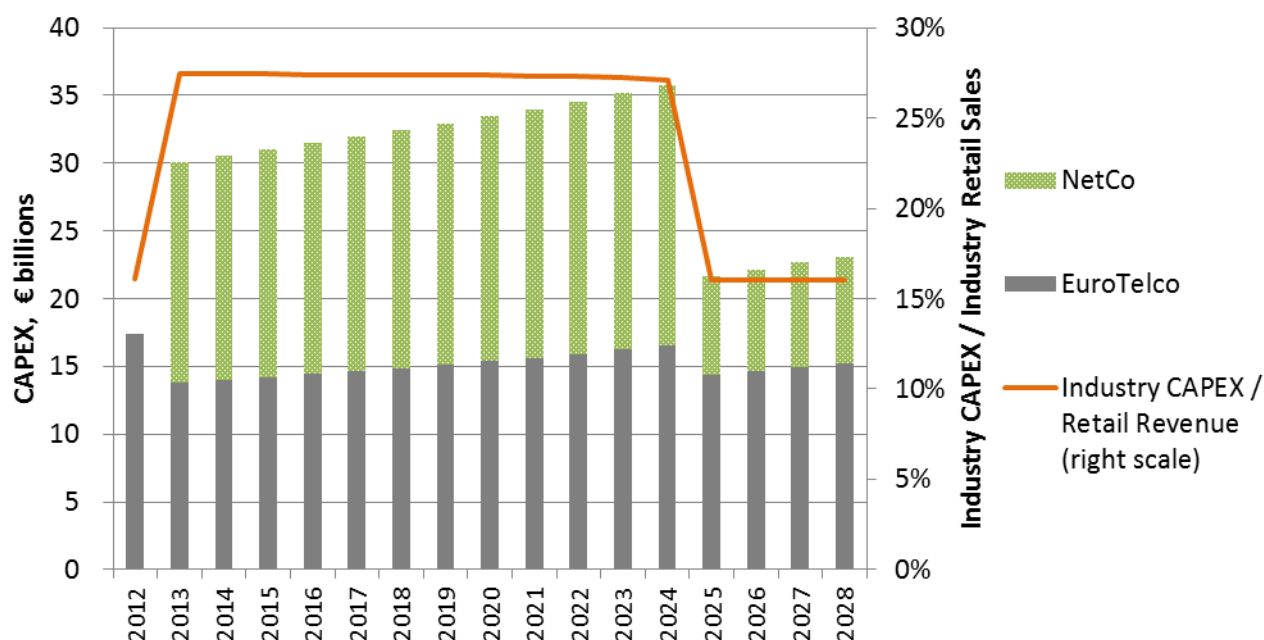


Figure 33 Projected CAPEX – 12 Year Case

We assume that aggregate industry CAPEX (i.e. EuroTelco + NetCo) will always be at least 16% of retail revenues. During the switchover of course CAPEX is much higher but the majority of this is funded off-balance sheet. For EuroTelco, fibre CAPEX is around 30% of its total CAPEX throughout the switchover period, which seems eminently sustainable and achievable.

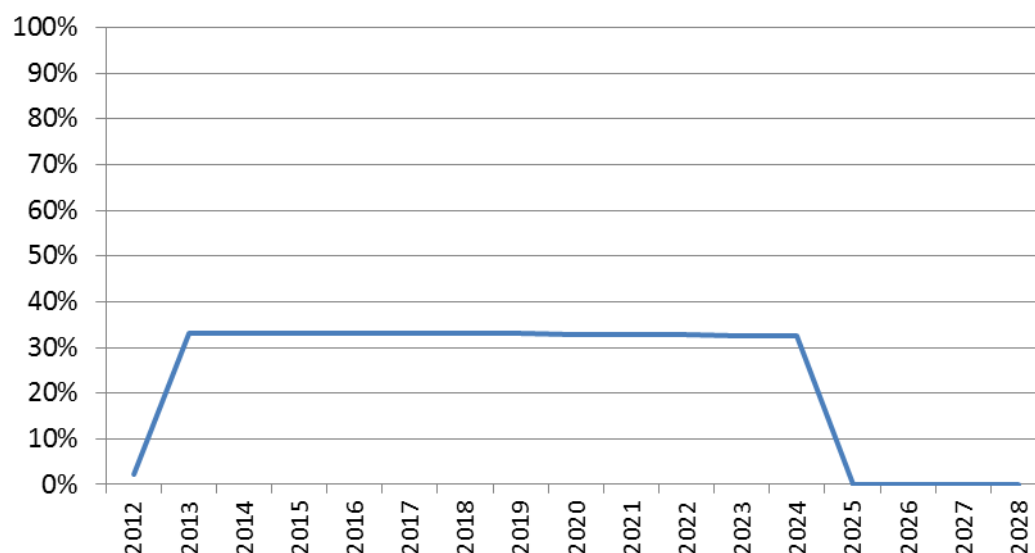


Figure 34 Proportion of EuroTelco CAPEX That is Fibre Switchover – 12 Year Case

4.3.2 Implications for Incumbents

Our preferred financing scheme can keep the debt required to finance the new build off the incumbents' balance sheets. Since the CAPEX is at its lowest in the black areas, the impact upon the incumbents' cashflow and P&L is minimized. Even though the incumbents would be incurring additional costs in leasing access in the white areas from the NetCo; in our modelling we were careful to ensure that our CAPEX and timing ensured that the incumbents' could continue to pay growing dividends at historically observed levels. We also took into account current CAPEX levels, and the extent to which these monies could be re-directed into fibre build out.

Since the incumbents would be putting their assets into regional Special Purpose Vehicles, we assumed that they would be compensated for this at a fair market value, though the payment for this sale could be sculpted to match the cashflow dynamics during the rollout phase. This cashflow would be designed to allow the incumbent to fund CAPEX and continue pay dividends. In summary, the impact upon the incumbents is as follows:

- Incumbents will incur a new cost in rentals for the fibre infrastructure built out by the intervention projects.
- The debt and debt service will be ring-fenced at the NetCo level and not affect the incumbents.
- Incumbents are compensated for their assets at what we believe to be roughly fair market value.
- Our calculations indicate that incumbents' overall CAPEX levels will not increase, though a much larger portion will have to be devoted to fibre rollout.
- Incumbents or operator consortia working with NetCos have call options to buy back the renewed infrastructure at a future date – the removal of build & regulatory risks by that time and the benefit of opex cost reductions provide the means to finance such buy backs although we have not modelled these.

4.3.3 Results at the “NetCo” Level for Government Authority Support

At the level of the Special Purpose Vehicle, we see substantial public sector support in the form of Availability Payments, which would be designed to bridge the gap between rental revenues and required debt service. We also assume that it would be the NetCo itself that would compensate the telcos for their assets in the manner described above. This latter would naturally have the impact of reducing cashflow available for debt service, and will increase the requirement for Availability Payments.

We set out below the level of Government support that will be required in our six scenarios at the NetCo level. It should be noted that these numbers are not Net Present Values, and also include the impact of inflation. They also include the support required to allow the NetCo to purchase the incumbents assets in the Grey/White areas and to service the debt required to build out the FTTH Network.

Duration of Fibre Switchover	Weighted average tenor of debt	
	15 years	7 Years
8 years	103	135
12 years	63	88
15 years	38	44
25 years	-	-

Table 6 Cumulative Public Sector Support (Availability Payments) for Varying Switchover Durations and Weighted Average Debt Tenors

The results above show that the amount of Government support decreases the more slowly the switchover is implemented. This will be true whether a PPP approach is used (as modelled here) or project bonds are the means of financing projects – or indeed a combination of the two. In broad terms the decision tree for Government Authorities is as shown in the flowchart below.

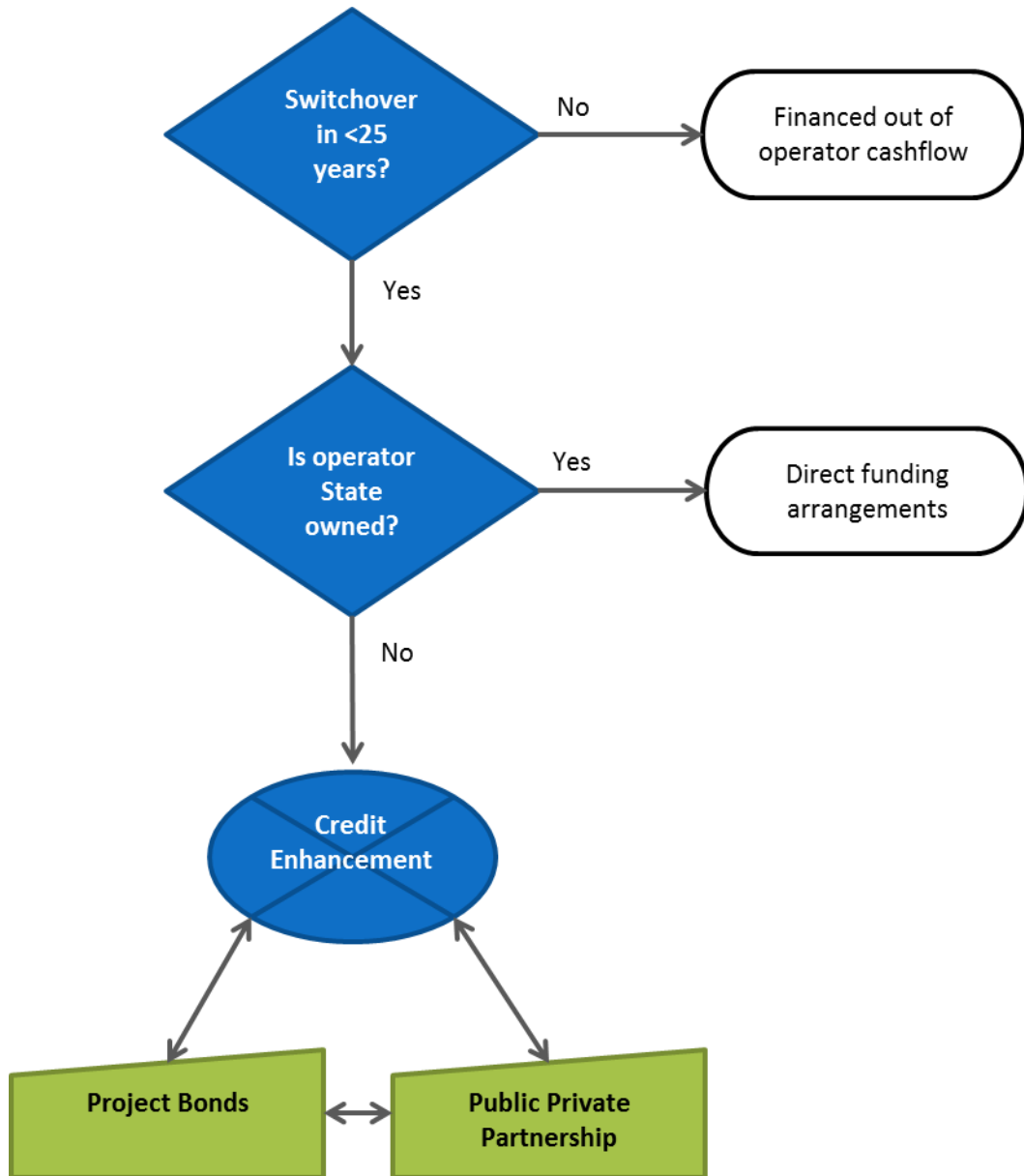


Figure 35 Simplified Fibre Switchover Funding Decision Process for Government Authorities

5 RECOMMENDATIONS: Seven Steps to Achieve the Fibre Switchover

It is self-evident that current policies are not delivering much progress towards ultra-fast broadband in most of Europe and yet such network renewal would benefit customers, operators, investors and economies as our research has shown. We believe a significant and radical change in approach is both needed and justified.

The Fibre Switchover would be an initiative requiring a collaborative approach by industry, investors, regulators and Governments to achieve the complete replacement of copper pairs by fibre within 15 years whilst minimising the cost to the taxpayer.

To achieve the Fibre Switchover we recommend a seven-point action plan as follows:

- 1) Modify the regulatory approach to the local loop by putting long-term contractual relationships to the fore and thereby creating public, operator and investor confidence in a stable, transparent and predictable regulatory environment. Delivery commitments should be publicly documented, transparent, reinforced by performance guarantees, and non-delivery be penalised with appropriate penalties and/or cash clawbacks;
- 2) Enforce the existing social contract for replacement so customers get the modern infrastructure that they are already paying for;
- 3) Change the economics of grey and white areas using targeted transfers or interventions so that PPPs and similar project financing approaches stimulate renewal of the natural monopoly access network. Rather than national scale interventions we envisage a series of regional projects, benefitting from learning by doing and with an optimal size of €200-€500 million to attract a range of financial and industrial partners;
- 4) Ensure that regulated wholesale prices for copper access reflect its long term higher costs and charge a sufficient premium to drive technological migration in retail markets. Additional cashflows generated by such strategic copper prices should be directly used to help fund the Fibre Switchover;
- 5) Update the concept and mechanisms of universal service to fully support the Fibre Switchover in the grey/white areas. Greater symmetry in fixed market regulation of black areas should ensure that Cable TV operators make a fair contribution in any Member States where they do not already do so;
- 6) Smarter intervention by Government and EU Authorities to both emphasise stimulus rather than subsidy (thereby also reducing total life costs of intervention to the taxpayer) and the establishment of Fibre Development Corporations to act as impact investors - creating a pipeline of bankable deals and a financing ecosystem to enable the Fibre Switchover;
- 7) Provide active support for community self-provision in those areas where this will either deliver faster modernisation or significantly reduce whole-life costs to other customers and taxpayers.

Our concept is analogous to the recent terrestrial television digital switchover. Just as there was no consideration of leaving analogue TV channels running after television's digital switchover, we believe there should be no concept of copper continuing longer than it needs to – it imposes both excessive direct operating costs on all customers and lost opportunity costs on those customers left on copper and would be a sub-optimal outcome.

In the remaining sections below we elaborate each of the seven points in turn and then provide some concluding remarks and observations.

5.1 Modify the Approach to Fixed Telecom Regulation Adopting a more Contractual Style to both Provide Stability and Enable Incentives for Operators

Based on our discussions there seems to be a consensus that in the absence of a clear direction towards a Fibre Switchover Governments and regulators tend to be reactive to short term lobbying. This leads to what one economist described as a “random walk” – a series of random steps without connection to each other. Such behaviour is anathema to long-term investors whether they are an operator or an infrastructure fund. Fibre projects have payback periods of several years duration and much longer in the grey/white areas. Regulatory timescales (particularly for support schemes and pricing) also need to be defined and stable over similar periods. This sort of thinking is common practice we believe in other utility sectors or for certain types of franchise or concession but is largely absent so far from telecoms.

Markets work best where the rules are clear, stable and where information flows freely. Transparency is, in our view, an important factor underpinning stability. Defining clear parameters, goals and deliverables in return for openly acknowledged concessions or regulatory guarantees provides both price information to the market and builds stability. Transparency will lead to a certain level of scrutiny and accountability on the part of Authorities, industry participants and the public.

We recommend that Europe's approach to regulation shifts towards a more contractual style, recognising that competition in services rather than infrastructure is the only viable solution outside the black areas.

In our view, it would be better to ensure a fair but transparent rate of return for long-term investors in a stable framework so as to ensure a modern infrastructure over which service providers can compete freely.

If a regulatory concession – for example in terms of pricing – is negotiated then it should be transparent, long term and against clear deliverables. In the event of non-performance, cash clawbacks, step-in rights or takeover of relevant assets or other remedies should be automatic.

Similarly, in order to enable a free flow of market information and stimulate confidence, public interventions should be openly documented in reasonable detail (number of homes, cost per home, cost per major component etc.).

5.2 Enforce the Existing Social Contract for Replacement

The customer already pays for timely asset renewal in the network in regulated prices. Simply ensuring that customers get what they already pay for would put Europe on track for fibre everywhere in 25 years or so.

Of the €20 billion estimated fixed network CAPEX each year in the EU27, access network renewal of just under 4% of premises each year would imply around €10 billion of investment compared to current access

network investment for fibre of very roughly €3 billion pa. This level of investment in renewal is therefore clearly within the existing financial capacity of the industry.

Our financial modelling indicates that this level of background replacement would comfortably be sustainable - certainly in the black areas and probably for significant parts of the grey. For nationally regulated operators, prices are set based on national data and take into account cost variation and even the extreme cases presented by the white areas. Provided these models are broadly correct in terms of their assumptions and logic then there seems no reason why a contractual renewal process would not eventually renew the entire network including the white areas.

5.3 Change the Economics of Grey/White Areas Thereby Encouraging Use OF Infrastructure Financing

Although contractual renewal should deliver the Fibre Switchover to the grey-white areas in the long term, the process could be accelerated by Government intervention. Our interviews have shown that there is no shortage of capital for infrastructure investment and in fact many funds we spoke to are keenly interested in access fibre. The problem is that they are not presented with the right structures by the telecom industry. Adopting a Fibre Switchover and the other recommendations would create the conditions in which it is much more likely that such infrastructure finance deals would occur.

The role of Government in these deals would be to change the economics of marginal or fundamentally unviable areas not by the use of one off subsidies (which are generally grossly inefficient and often a poor use of taxpayers' money) but by supporting the creation of bankable infrastructure projects.

Such projects could develop with the incumbent as the sole industry partner, or with a new NetCo operator or perhaps involving a consortium of major operators to ensure the national industry has a stake in the use and success of the regional network.

5.4 Strategic Management of Copper v Fibre Wholesale Prices

Prices signal underlying costs and economic incentives directly to the service provider section of the industry and indirectly to the customer. In the context of encouraging a switchover, we believe three conditions should be fulfilled in the strategic management of prices by regulators:

- total wholesale revenues are constant in real terms or increasing if possible meaning regulated prices should be consistent with this goal;
- between fibre and copper there is a clear (15% or more) price difference in favour of fibre;
- the replacement element of copper revenues – and any premium allowed to help bring about the first two conditions – should be devoted to Fibre Switchover CAPEX.

A strategic approach to the relative pricing of copper to fibre would best be determined as soon as possible and implemented in a stable framework of 10 years or more duration. Stability and predictability are crucial for infrastructure investment.

Trial & error or erratic changes in pricing risk depressing the rate of investment below the otherwise achievable rate.

5.5 Update the Concept of Universal Service and Increase Symmetry of Regulation Applied to CATV and Other Significant Access Network Operators

Infrastructure investors favour a clear and stable framework in which grey-white area projects will receive payments to support their higher cost of deployment. For an investor, where a project receives USO payments as well as Availability Payments, this contributory source of revenue reduces dependency on a single public authority and so reduces risk.

Quite apart from that consideration, it seems doubtful to us that current universal service funding arrangements have been adapted to the major programme of renewal that we advocate. We have not been able to study this issue in detail but it seems highly unlikely that such schemes are tied to contractual delivery of modern fibre infrastructure, as we would envisage.

We also take the view that if they do not already do so then levies to fund universal fibre should extend, in a fair way, to cable TV and other significant access providers.

5.6 Smarter Interventions and Impact Investors (Perhaps Including the CEF?)

5.6.1 A Subsidy is Not a Stimulus

In recent years many public sector interventions have been implemented as procurement exercises whereby an investment or delivery of service is procured by Government as if it were any general good or service. We have two objections to this approach:

- Procurement is the wrong tool for the job – the logic is to obtain the best offer from a range of competing suppliers when it is clearly the case that there is rarely (if ever) much choice in suppliers of telecom infrastructure in many of the rural areas – at least not with the current approach. Infrastructure is not like a rural bus service where the assets may easily be deployed into an area or re-deployed at the end of a scheme. We believe it would benefit from a different approach.
- A one-off subsidy does little to create a bankable entity that would be able to use infrastructure financing to multiply the impact of the taxpayers' support. In that sense, it is an inefficient use of public funds although in some cases of course, perhaps for reasons of market dynamics, political perception or scale, our preferred approach may not be feasible.

As an alternative, we recommend the PPP style of project financing. This approach allows for a sale, leaseback, buy back approach so that the telco or consortium of telcos that backs the project will own the new modernised assets in the long term, but without suffering the balance sheet strain of high CAPEX in the interim.

We envisage that, if operators of consortiums chose to use off balance sheet financing then this will be on a discrete project-by-project basis, and that many of these projects will have Regional Authorities as major Project sponsors. This has been the case for the PPP Projects that have been done to date. The optimal size for such projects would be in the region of €200m to €500m, making them interesting to senior lenders and Private Equity funds, whilst being at a manageable size for due diligence purposes.

5.6.2 Impact Investors (Perhaps Including the CEF) Could Make a Major Difference

In this report we have repeatedly stressed the importance not just of the involvement of the public sector, but that the structure of its intervention should do more than simply provide grant funding. Grant funding does not necessarily generate financeable projects and so makes less of a difference than other structures.

We feel that public sector support should be structured, as is currently envisaged with the project bonds pilot, using established financial instruments that can respond to market demand and be adapted for the purpose. This approach would enable the greatest participation of commercial funders, and therefore the greatest financing stimulus for any given amount of taxpayer support.

However, the success of the project bond initiative will depend on a healthy pipeline of deals developing. The fibre projects we envisage are generally large, are breaking new ground and take time and money to develop. They also require specialised industry and financing expertise that is in short supply at this early stage. For these reasons, we believe that investing authorities should also nurture and manage projects in their early stages so as to develop a pipeline of deals that larger institutions can deal with. The ecosystem needs kick-starting.

Consequently, we feel that there are two main principles that should be considered. Both are equally important in our view, and they are as follows:

- The structure of the investment should encourage a lasting engagement between the project and the Authority in order to create a bankable entity. This is the reason we favour an on-going availability payment structure over up-front grant funding.
- The investing organization would be staffed with people having the management and entrepreneurial skills to nurture and grow projects, and so to act as a visionary entrepreneur who will nevertheless accept returns below market norms, or even perhaps, zero return on investment – at least for a time, in return for delivery of coverage.

At this point, whilst the CEF is still in the process of crystallizing its terms of reference and legal status, we feel that there is an opportunity to design an entity that will act as an “Impact Investor”. By impact investor, we mean an organisation focussed on the impact that it makes rather than purely on financial return. The success of such an investor will be primarily measured not by how much it has invested nor by what return it achieves, but instead by its impact in nurturing new projects (i.e. precisely the “greenfield” start-ups of which other funders are so wary).

We envisage a series – perhaps five or six around Europe – of Fibre Development Corporations to act as impact investors charged with accelerating the Fibre Switchover. Their key performance metric will be number of premises fibred to specific minimum quality standards. We would envisage these bodies administering and using the important new additions to the fibre financiers’ toolkit, such as the new project bonds and their related credit enhancement, along with any other financing structures the CEF decides to adopt. The characteristics of these bodies would likely be as follows:

- 5 or 6 bodies covering Europe to generate a measure of competition between them, whilst steering clear of national or EU politics.
- Time limited to say 2025 or once Next Generation Broadband goals achieved – whichever is earlier.
- Achievement measured by coverage, speed and quality metrics in preference to amounts invested or returns.

- To have the constitutional and management capability to run an appropriate, flexible, range of financing schemes, including those proposed by the CEF.
- To have the management capability, organisational culture, staff profile and corporate governance enabling it to act as an entrepreneur.
- To have a cap on staff numbers and direct expenses – perhaps no more than 15 people per Corporation
- To work in co-operation with existing EU bodies such as the CEF and EIB.

5.7 Support for Self-provision and Consumer Incentives

There is a long tradition of self-provision of local networks in rural areas, particularly in Scandinavia. Such schemes can be highly cost effective as they harness altruism and community spirit to build infrastructure at a much lower financial cost than is possible by other means. There is no need for such schemes to be limited to rural areas although that is usually where they arise.

There are two basic types, both of which merit support:

- Fully or majority constructed by a community or project organisation;
- Built by a construction company but paid for by customers. For Example, in Sweden such schemes charge €1000-€3000 in advance then monthly fees as usual. Homes that do not contribute in advance may join the scheme later but need to pay the same or a higher charge. There are already many variants of such a general scheme.

Experience in Scandinavia suggest that such initiatives can be an excellent way to build a network but running services and maintaining the infrastructure long term are more complex activities and it can be difficult to maintain volunteer efforts over many years.

Such arrangements are common in Scandinavia and provide a win-win for the operator (or consortium of operators) and communities. It would be helpful therefore if major operators would support such schemes through making an open active layer available and at least taking on operational responsibility for the active layer. Regulators might – perhaps should – also use universal service funds to help fund such projects. An operator (or consortium of operators) may also benefit by part financing such projects and Fibre Development Corporations could also set aside a part of their people and financial resources for such schemes.

Regarding general consumer incentives, we suggest Governments consider:

- Encouraging Mortgage Backed Finance: self-provision, particularly paid upfront construction, often relies on homeowners adding to their mortgage slightly to invest in fibre as a home improvement (it often adds value to a property). It may be that Government can encourage mortgage lenders to make this form of addition borrowing easier or lower cost, or Government could provide interest rate tax relief to reduce costs.
- Consumer Tax Incentives: where consumers (and perhaps developers) self-provide fibre, Governments should consider offering tax breaks perhaps by foregoing VAT or allowing costs to be written-off against income tax. Many Governments offer incentives of this type for solar energy heating and so on. We believe that fibre is a good candidate for similar incentives over the next 15 years or so.

5.8 On Balance, Operators Would Benefit from Our Recommendations

Europe's operators are mainly privately owned companies with clear duties to their shareholders. We believe that our recommendations – if adopted in the balanced way that we envisage – would benefit operators and their shareholders for the following reasons:

- **The switchover is a step change improvement in productivity offsetting medium term regulatory risk:** If we assume the switchover can be funded on reasonable terms (perhaps partly off balance sheet), then surely moving to a new platform that can deliver a lot more in terms of services at a lower whole life cost will be a good thing? Certainly, it will be a major transition and requires a new and stable regulatory framework but we take the view for our clients that it is better to embrace positive change than to resist it. Ultimately, there will be growing pressure from Governments – and in the medium term also from shareholders and financiers (who have benefitted elsewhere already from fibre programmes) for a clear direction towards a better regulatory deal and higher company productivity.
- **Contractual regulatory stability:** We envisage a regulatory framework for fixed that is more contractual in nature and defined and stable for the next 15-20 years. This will require the regulator to accept a curb on their scope for intervention at a later date. We think this will generally be guaranteed project by project, business case by business case although that would require a break with the predominant practice of setting a single national wholesale regulated price. The benefit for the operator and investors of course is the stability that is an oft-repeated plea. In turn, however, the operator will have to deliver.
- **Financial returns:** Our scheme enables EuroTelco to shed low performing rural assets and maintain the same free cashflows and dividends without strain on the balance sheet. When complete a full fibre network will enable new services and much lower costs to greatly improve cashflow margins. EuroTelco at that point may decide to buy back the assets or simply enjoy the cashflows.
- **Timely replacement:** We know from our interviews that the idea of enforcing the social contract for timely replacement is highly unpopular with operators. It reduces freedom of action and there may be more attractive short-term uses for that captive cashflow. Our view is that a reasonable level of background replacement is a benefit because it protects the business long term both commercially and politically from adverse developments. In our view, it is not a tenable position to assume windfall profits on obsolete assets will continue indefinitely.
- **Support for grey/white areas inc. off balance sheet funding:** Focussing on control of, or at least ease of access to, the infrastructure rather than ownership is an acceptable approach in mobile and we think it also has merit in fixed. Rather than strain the telco balance sheet surely it is better to tap the enormous funds available for infrastructure investment to gain operating and financial leverage.
- **Regulated stable pricing to reflect your commitments:** Rather than cutting prices, we advocate maintaining and probably increasing them slightly for copper networks. We recommend a clear and stable long-term pricing approach agreed by the regulator (and contractually guaranteed with them to a high degree) to generate both some financial contribution and the sales drive towards the switchover.
- **Greater symmetry in regulation of black areas:** We have not been able to study current universal service funding arrangement in this project but we assume they are not in general geared to the challenge of a fibre switchover. It seems clear to us that the Cable TV industry and major business access operators should contribute to the cost perhaps implying a greater symmetry of regulatory approach in the black areas than is generally the case today. Such levies will form substantial revenue towards funding grey/white area projects.

- **Shifting the greatest burdens off the telco:** For the most expensive or difficult areas we recommend the Finnish example whereby the incumbent makes deals with local community based builders. They build the access network under your guidance and you in turn guarantee to provide wholesale and retail services (or at least retail – it may be better in some cases to rely on an independent wholesaler). You gain an new access network at very low cost and the community gains service and, if all goes well, will have a great deal of goodwill to the company.

5.9 FTTx as an Interim Technology and Consistency with Open Wavelengths

This report has focused on a complete switchover to fibre. We believe this strategic clarity is required in order to drive policy and investment. However, it is clear that the transition will take a number of years and so FTTN, FTTC, FTTB and related technologies¹⁷ have an important interim role. They are interim steps on the way to a full deployment of fibre and part of their investment can be re-used later. FTTB generally provides a low-cost access at 100 Mbit/s per second or more, and so offers a long-term alternative to a purely fibre network.

We do not have a firm opinion on the merits of FTTB long-term, and recognise that FTTC will be used by some as an interim solution with higher on-going operating costs than fibre and a shorter asset refresh cycle. In our view, current regulation would ideally encourage the development of FTTB and FTTC to the extent that measures do not detract from the Fibre Switchover.

The direction of telecom technology is also consistent with a Fibre Switchover. Work is underway for a new TWDM-PON standard that will allow different service providers to use different wavelengths on a passive optical network. Such a technology therefore offers a fully open and complete form of infrastructure sharing where each service provider has a huge envelope of bandwidth (whole wavelengths) to deliver whatever services they want. There is also discussion of enabling the customer equipment to take service from more than one provider, i.e. from more than one wavelength. It seems to us that such developments are consistent with, and supportive of, the kind of NetCo off-balance sheet financing that we envisage. In the grey/white areas the goal of enabling customer choice and competition is clearly much better served either by means of selectable wavelengths or by means of different fibres in a suitably architected shared (and therefore low unit cost) fibre infrastructure rather than by over-building.

5.10 After the Fibre Switchover is Complete

Finally, we would like to look ahead to when the Fibre Switchover is complete. At that distant future point, efficiency gains and the general benefits of a new infrastructure will be improving the financial performance of fixed operators and the NetCos will be paying down their debts.

Eventually the NetCos will be cash generative and may move back into telco ownership depending on the specific deals done. We suggest that regulators learn from the recent past and, once the debt has been paid off, ensure that some capital reserves are built up as provision for the next wave of asset renewal.

Ultimately, if fibre proves to be a very long lived asset and reasonable capital reserves have been built up then we would anticipate that regulated prices will adjust to whatever the anticipated realistic asset lives are and that the regulatory system generally will avoid over-recovery of infrastructure capital costs.

¹⁷ For a review of approaches see https://en.wikipedia.org/wiki/Fiber_to_the_x

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Glossary

Authority	In this context we mean a Government or public body which wishes to part fund an FTTH project.
Availability Payments	An on-going payment (usually from an Authority to a contractor) that is triggered by the availability of certain infrastructure (or service) meeting agreed Key Performance Indicators. Where availability / KPI standards are set and not met by the suppliers, or projected revenues are greater than expected, the service fee may reduce.
CAPEX	Abbreviation for Capital Expenditure – i.e. investment in plant and equipment.
CATV	Cable television – these networks now generally use a combination of fibre and coax for the final drop which enables large bandwidth to be delivered to the mass market
Credit enhancement	The ability to finance a project is supported or enhanced by a Government body offering availability payments to in effect guarantee a certain level of revenue. The level of payments will vary with the relative success or failure of the project. This is different to the alternative is to provide grants or subsidies to reduce CAPEX which are fixed irrespective of success in attracting customers.
DAE	Digital Agenda Europe – an initiative of the European Commission. http://ec.europa.eu/digital-agenda/
EBITDA	Earnings before Interest, Tax, Depreciation and Amortisation is a commonly used measure of cashflow that removes the effect of non-cash accounting policies (like depreciation), financial structure (of which interest is a function) and tax.
FDC	Fibre Development Corporation – a new specialised impact investor (see below) proposed in this report
Impact investing	A form of social venturing in which investments are made based on not only financial returns but also the social and environmental impacts of the investment (either its operations or the consumption of its output). An impact investor seeks to enhance social structure or environmental health as well as achieve financial returns.
Liquidity	A measure of money available in the financial market. A “highly liquid” market is one where conditions are right for money to be available and move freely.
MDU	Multiple dwelling unit – an apartment block. These, clearly, generally need much less investment per home to provide fibre than single house or at the extreme, widely dispersed farmsteads.
NGA	Next generation access, which we define to mean an access network capable of supporting at least 100Mbps download services to the mass market. In practice the only known alternatives are fibre or upgraded CATV
Off-take agreement	An agreement between a producer of a resource and a buyer of a resource to purchase/sell all or part of the producer's future production. An off-take agreement is standard in project finance and is normally negotiated prior to the construction of a facility (in our case a network) in order to secure a market for the output, i.e. future revenues. A well-constructed and robust off-take agreement is something that banks will lend against.
PPP	Public-private partnership (PPP) describes a government service or private business venture that is funded and operates through a partnership between government and one or more private sector companies. PPP involves a contract between a public sector authority and a private party, in which the private party provides a public service or project and assumes substantial financial, technical and operational risk in the project. In projects that are aimed at creating public goods like in the infrastructure sector, the government may provide a capital subsidy in the form of a one-time grant, so as to make it more attractive to

the private investors. In some other cases, the government may support the project by providing revenue subsidies, including tax breaks or by providing guaranteed annual revenues (aka availability payments) for a fixed period. (source Wikipedia)

Private Equity	In this context we mean any funds with the capability to invest substantial amounts (Between €50 - €200m) into projects and potentially taking a majority share of the SPV if required for off-balance sheet accounting reasons. Within this universe of investors, there will be those specializing in infrastructure finance, exhibiting a longer investment horizon, and somewhat lower return requirements (IRR of 12% acceptable). In our illustration of investor types (see above) We have shown them separately, as these investors have all the appropriate characteristics necessary to execute on our Suggested PPP Structure.
Project finance	This form of financing is sometimes called “limited, or non-recourse”, it is this aspect of the financing where increases in liquidity lie. Most current FTTx rollout is happening in Urban areas (the “black” areas) where incumbents and CATV operators are upgrading their networks, with money they borrow using the strength of their balance sheet. These balance sheets naturally have a finite capacity, and the amounts to be borrowed are large. For Operators to borrow enough to cover significant CAPEX in the grey and white areas would involve prohibitively high levels of borrowing. To get around this problem, the answer is to take the financing off balance sheet. In our Preferred Structure, the financing is secured by a Special Purpose Vehicle (SPV). The envisaged off-take agreements (see above for definition) by the incumbent (or CATV or Altnets) will generate a more predictable cashflow stream through the SPV, enabling Private Equity involvement and Limited Recourse financing which would not be on the balance sheet of the incumbent Operator or the Authority. This is the main factor driving financing stimulus in this structure.
PSBR	Public Sector Borrowing Requirement – the UK term for various methods nationally used to define and monitor total borrowing by the public sector aggregating borrowing across all public sector authorities, institutions and bodies of various types.
Relationship Banks	The description relationship bank does not describe a special type of bank but refers to the bank that a company uses as its main bank and which provides most if not all of its banking services, accounts etc. Clearly, a large company will have regular communication and a ‘relationship’ with its main bank.
Tenor	The duration of a loan from the first drawdown until final repayment.
Special Purpose Vehicle	In this context, an SPV is a company set up specifically for the purpose of receiving cashflows from a project and to service the debt borrowed by the SPV specifically for that project.
Tax Increment Financing (TIF)	A Government financing technique that is used to subsidise redevelopment, infrastructure, and other community-improvement projects. A major infrastructure project will usually increase the value of real estate and hence ultimately taxes arising from those properties. Some schemes may rely on local income, sales or other such taxes. Such “tax increments” are dedicated and ring-fenced by Law or binding contract in order to re-pay loans that help fund the development project.