Fibre To The Home (FTTH) Information Paper

1. Purpose

The purpose of this paper is:

- to provide a overview of fibre to the home (FTTH) development in Australia and internationally and
- to highlight emerging and potential issues in FTTH greenfields developments

2. Introduction

FTTH is a developing fibre technology which is currently being rolled out to varying extents around the world. This paper explores what it is, where it is, how much it costs and what some of the potential competition issues could be.

An FTTH network uses optical fibre between a central point (the Optical Line Terminal) all the way to the customers' premises. Typically, but not exclusively, passive splitting[1] of the optical path is used. The key difference between FTTH and other FTTx[2] technologies is the depth of optical fibre penetration into the access network. The network configuration for FTTH and FTTP is virtually identical and the two terms are sometimes used interchangeably.

However FTTP is most accurately used to describe where the service is taken to a multi dwelling premises, whereas FTTH describes where the service is taken to individual homes or businesses.

The four FTTx technologies, in order of an increasingly longer fibre loop are:

- Fibre to the node (FTTN)
- Fibre to the curb (FTTC)
- Fibre to the building (FTTB)
- FTTH

For FTTH within the customers premises the signals can be distributed using either copper wire pairs or using Wifi. By comparison, for FTTN the length of the copper wire pairs is typically kept to less than about 1 km so that data rates over the copper pairs can be up to approximately 50mbps. With FTTC, fibre is also taken to a street cabinet and copper wire pairs are used the for the connection to the customer's premise, but unlike FTTN in this case the street cabinets are placed so that the length of the copper wire pairs is considerably less than for FTTN to enable higher data rates. For FTTB, the fibre terminates at a multi unit

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[1] Since no electronics are needed along the whole path of the optical fibre, including at the optical splitter, the optical network is 'passive' rather than 'active'. The terminology is then 'PON' for 'passive optical network'.

[2] Fibre to the x (FTTx) is a generic term for any network architecture that uses optical fibre to replace all or part of the usual copper local loop used for telecommunications.

dwelling and a non fibre local area network (LAN) delivers service to the individual subscribers.

A comparison of the FTTx technologies is outlined in Figure 1 and 2 below and the specifics of the network architecture are detailed in section 3.

There is not one key driver for FTTH development, however the desire to increase high speed broadband coverage to deliver increased bandwidth for multiple services has been highlighted as a key factor. In Australia FTTH is in its' infancy where FTTH deployments represent under 1% of Australian broadband connections.[3]

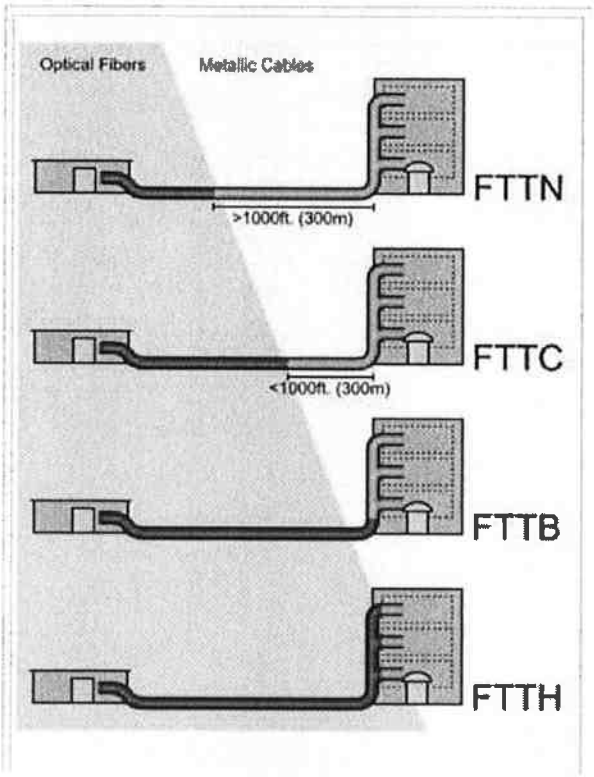
The majority of FTTH in Australia is found in greenfields (ie new developments) as opposed to brownfields (where telecommunication services already exist). The main players in greenfields are Telstra, Opticomm, BES (e-Wire) and Pivit. No major ISPs other than Telstra and Internode offer retail services in FTTH areas. There have also been some state based initiatives in brownfields linked to power utility Aurora energy.

Internationally Japan, Korea and some parts of Europe already have significant deployments of FTTH. Also European markets are experiencing significant utility and alternative operator roll out of FTTH.

Emerging competition issues in Australian FTTH greenfields deployments centre around issues of inadequate disclosure of terms and conditions and high cost pricing.

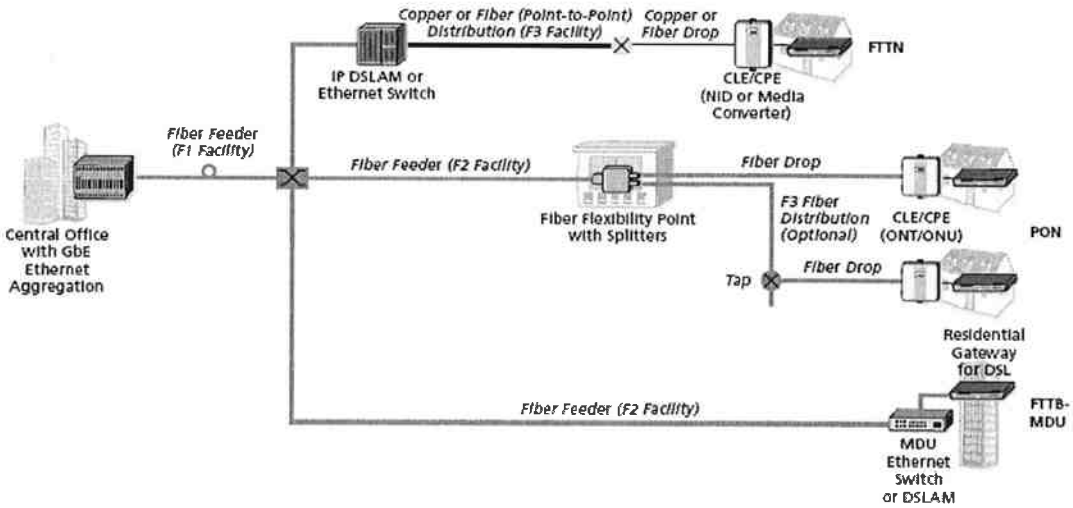
[3] ACCC Broadband Update – January 2009 – FTTH Council data only represent countries with greater than 1% household FTTH penetration and Australia does not make the list coming in under the 1%.

Figure 1: Comparison of FTTx – illustrates length of fibre for each technology



Source: Wikipedia FTTx description < http://en.wikipedia.org/wiki/Fiber_to_the_x>

Figure 2: Differences between FTTN, FTTH (Passive Optical Network PON) and FTTB

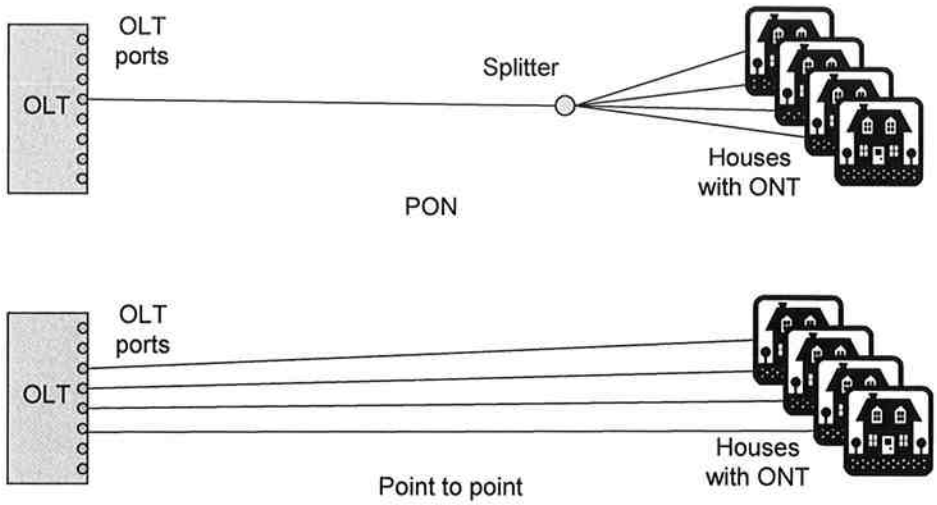


Source: Alcatel Lucent, *Technology White Paper Deploying Fibre to the most economic point* , 2007 p.7 <www.alcatel-lucent.com>

3. FTTH Network Architecture

Like in Europe, initial FTTH roll outs in Australia appear to start with business customers utilising dedicated Point to Point (P2P) link which moves to customer offerings based on a passive optical network (PON) with the fibre spilt to 64 customers or fewer. Dedicated P2P FTTH involves an optical fibre link from the Optical Line Terminal (OLT) to the premises where there is no sharing of the optical fibre or splitting of the fibre to a number of premises. It is likely to cost more than PON as each dedicated fibre line will require its own OLT. Also P2P may require additional duct space. However P2P does not require a splitter or splitter housing. (The price of a splitter is approximately **[c-i-c]** US$250 **[c-i-c]** for a 1x32 or **[c-i-c]** $7.80/port.)[4] **[c-i-c] [c-i-c]** The primary cost differential between PON and P2P is the amount of fibre that has to be installed. **[c-i-c]** [5] A P2P architecture means that a higher number of optical fibres will be required. The extra fibre in itself is not a substantially greater cost as most of the cable cost is civil engineering and installation works rather than the cost of the cable itself, but adds considerably to fibre handling costs at the point of aggregation (for example in an Optical Distribution Frame) and to the port costs of the OLT (one port per fibre). The PON version is the most common version of FTTH and some engineers simply refer to FTTH as PON. The differences between PON and P2P FTTH is illustrated in Figure 3 below.

Figure 3: Difference between PON and P2P FTTH



[4] Ovum, *FTTx Regulatory Triannual Monitoring Reports: Report No.*3 (A report for the ACCC), March 2008, p.27

[5] Ovum, *FTTx Regulatory Triannual Monitoring Reports: Report No.*3 (A report for the ACCC), March 2008, p.27

3.1. Passive Optical Networks

As illustrated in Figure 3, the OLT sends and receives the signals sent across the optical fibre access network for all customers. The OLT can be expected to be located at a point where traffic can be aggregated from a number of FTTH systems.

The shared optical fibre carries optical signals from the OLT to a location quite close to the end customers' premises (perhaps to within several hundred metres). The optical splitter is used to split the optical signals from the OLT so that they are sent along each of the access optical fibres to the customers' premises. No electronics are needed to accomplish this (and hence no powering). The optical splitter is likely to be placed in a small street side cabinet. The optical cable from the OLT to the splitter would normally be placed in the ducts. For a brownfields construction these would be expected to be the ducts in current use for the copper network.

A single optical fibre per customer takes the optical signals from the optical splitter to the customer's premises. The lead-in to the customers' premises could be either underground or aerial. The optical fibre terminates at the customer's premises at an optical network terminal (ONT). The ONT sends and receives signals sent across the optical fibre network for the particular customer. It is located at the customer's premise and is powered from that location.

The ONT connects to the various equipments in the customer's premises used to distribute the signals to the various end devices. This might include a small router to provide connection to a computer, either using a local copper wire network or wireless (Wifi), and an adapter for an analogue telephone. Any installation at a customer's premise will require a truck roll because of the need to terminate optical fibres. If the optical cables are to be placed underground it would be expected that they would be in the ducts hence it would need to be ascertained that there was sufficient space. While ducts terminate at a local exchange building not all local exchanges would need to be retained necessitating some duct work.

In addition to the above access network components, the carrier will need to have:

1. A core IP network. Note that this is a private IP network managed by the carrier, not the internet.
2. Various servers to provide the applications used by the customers (for example a voice application server).
3. Media and signalling gateways to connect voice traffic to the public switched telephone network.
4. An underlying transmission network (probably an optical network in view of the expected high volumes of traffic).
5. Various business and operational support systems to manage customer services and to operate the network.

3.2. PON Standards

A number of standards have been, and are, currently used for an FTTH passive optical network (PON). These have included at least APON, BPON, EPON and GPON. APON and BPON are now obsolete, but referred to as 'ATM PON' and 'Broadband PON'. 'Ethernet PON' or EPON is an Institute of Electrical and Electronic Engineers (IEEE) standard and has been widely deployed in Japan and Korea.

'Gigabit PON' or GPON is an ITU-T standard and is now widely seen by carriers as the preferred standard in Europe, USA and Australia. The GPON standard is viewed as more advantageous than EPON for three main reasons:

- GPON has a better split ratio - more splits are possible (EPON does 1:32 whereas GPON can do 1:32 or 1:64). The distance from the OLT to the splitter can be up to about 20 km for both EPON and GPON however it is usually aggregated earlier than the 20km mark.
- GPON download speeds are faster – twice the download speed of EPON. EPON download speed is 1 gbps whereas GPON is 2.4 gbps downstream from the OLT towards the customers and 1.2 gbps upstream.
- GPON does voice better than EPON. EPON does not do voice well as it relies on the Ethernet protocol which does not have a class/priority of service for voice, whereas GPON gives priority and segregates voice and broadband rather than both being sent in one stream. Also GPON makes voice a priority.

3.3. FTTx speed capability

The speeds possible for FTTH, FTTN other FTTx technologies can change markedly with different network configurations and customer behaviour (eg such as the applications being used for example).

Speeds obtained by FTTN are more distant dependant, where the maximum optimal distance from the node to the customer premises is approximately 700m in order to obtain 50mbps. FTTH is not distant dependant and can achieve 50mbps with signals carried from much longer distances.

For PON FTTH, as with other broadband technologies, there is a portion of the network that is shared between customers, and that portion needs to be carefully managed in order to manage both customer expectations and the commercial viability of the network.

For all FTTx technology both the upstream and downstream capacity is shared, as is backhaul from the OLT into the carrier's core network. For FTTH the actual data rate available to a particular customer over the GPON portion of a connection depends upon the split ratio, the number of active customers at any particular time, and the nature of the applications being used by the customers. The quality of service provided to the customer is then a matter of economics. Customers may be prepared to pay more for a lower split ratio in order to obtain a higher speed. In view of the strong dependency of data rate on customer activity and applications used it is difficult to place a figure on just what the data rate is likely to be seen by the customer. Often the carrier will proactively set an upper limit to the data rate in any case to provide a more consistent service to a customer than would otherwise be the case. For example, if the data rate is set at 40mbps, the split ratio is 1:64, the downstream data rate is 2.4 gbps and the efficiency of use of the downstream data rate 90%, and all customers are simultaneously 100% active, customers can use on average about 34 mbps each.

4. What is the international experience ?

4.1. Presence of FTTH Internationally

Internationally, the number of countries where FTTH has established a significant and growing market presence has nearly doubled over the past 18 months, according to the FTTH Councils of Asia-Pacific, Europe and North America.[6] The FTTH Council produces a twice a year ranking of economies where more than one per cent of households are connected directly into high speed fibre networks. In all, 20 countries met this threshold, up from 14 in July 2008 and 11 in July 2007.

The growth is largely due to the entry of several European countries in the ranking, as FTTH deployment begins to expand across that continent and the total number of FTTH subscribers in Europe approaches two million.

South Korea, Hong Kong, Japan and Taiwan continue to occupy the top four positions in the ranking of FTTH penetration with:

- South Korea has 44% of its households connected to FTTH
- Hong Kong at 28%
- Japan at 24% and
- Taiwan at 12%.

Meanwhile, Japan remains the overall leader in terms of the number of fibre-connected homes at 13.2 million, followed by the United States (6.05 million) and China (5.96 million).

The Councils' ranking includes the breakdown for each economy between FTTH connections, where fibre is run all the way to individual residences, and FTTB. Copper-based broadband access technologies (DSL, FTTC, FTTN) are not included in this ranking.

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[6] Fibre to the Home Council, *Press Release Fibre to the Home continues its global march – number of countries with significant FTTH market penetration now at 20 as more European countries come online,* 12 March 2009 < http://www ftthcouncil.eu/documents/?url=documents>

As at February 2009 the breakdown between FTTH and FTTB for each economy is depicted in **Figure 4** below:

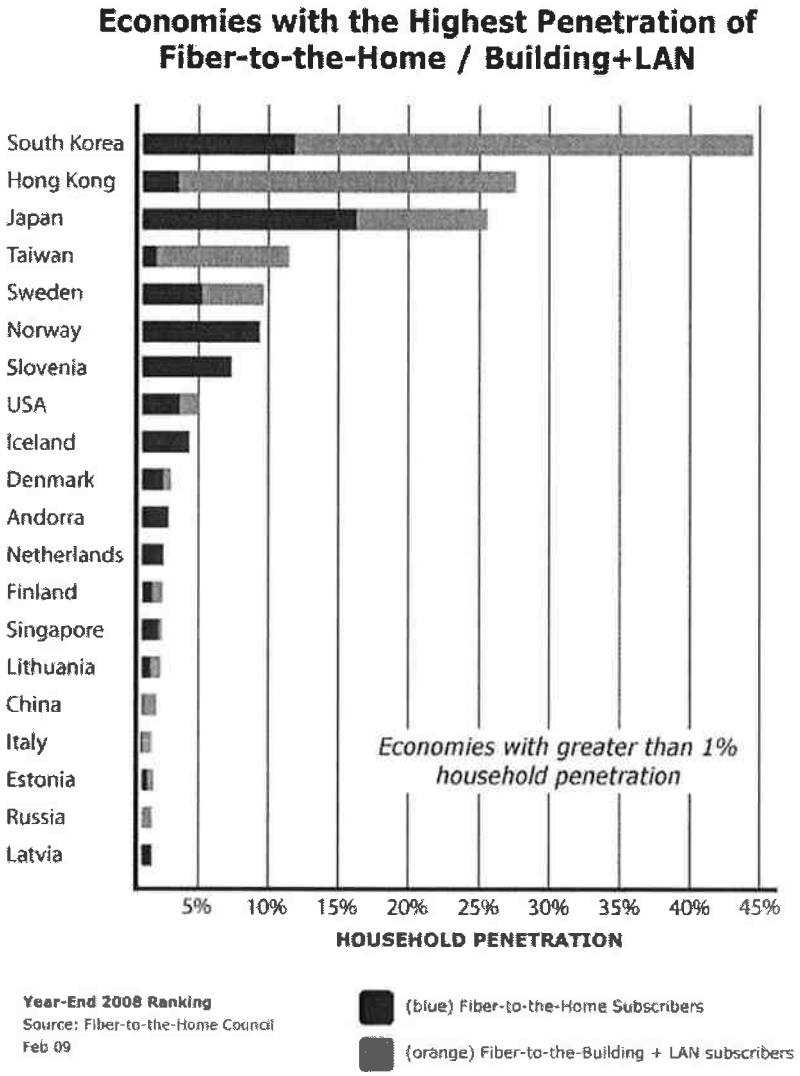

Figure 4 shows that FTTB also appears to account for all penetration in China, Russia, and Italy.

FTTH Council consultants have forecast that in Europe there will be 20.5m FTTH households at the end of 2013, with Russia and France leading the way, and Sweden and Slovenia leading on household penetration.[7]

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[7] G Finnie HeavyReading Consultants commissioned for FTTH Council, *European FTTH Forecast 2008 -2013*, FTTH Council Conference Copenhagen, 10 February 2009

The US is now about four years ahead of Europe on average in FTTH maturity while Japan is about 8-10 years ahead.[8] It appears that the level of economic development is not the main factor for high FTTH penetration as there is plenty of activity in eastern European nations with lower GDP.[9] A snapshot of international regulatory approaches is provided at **Attachment 1**.

National roll outs are soon to occur in Singapore and Holland (by CityNet).[10] Singapore is on track to start rolling out its iN2015 FTTH broadband network in the second half of 2009. [11] The NZ Government has announced a National Broadband Network plan to spend $1.5 billion dollars to roll out FTTB and FTTH supported by mobile and satellite technologies to cover 75% of the NZ population. The NZ Government has also highlighted that dark fibre backbone infrastructure will be a significant component of New Zealand's planned broadband network.[12] The NZ Government has committed to doubling to $48 million the Broadband Challenge Fund New Zealand established in 2006 to bring broadband to areas that didn't have it, and to provide fibre to urban areas. The fund will be re-focused on rural and remote areas.[13] A recent Castalia consultancy report has criticised the NZ Government's plan to subsidise FTTH as not an effective use of public money.[14]

In 2008, France Telecom announced plans to begin nationwide rollouts in 2009 (however it is not known exactly how far advanced those plans are currently). FTTH developments worldwide are summarised in tables 1 - 3 at **Attachment 2**. The precise location of roll outs is not noted, however it is usually a city/municipal government which is organising roll out to their city.

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[8] G Finnie HeavyReading Consultants commissioned for FTTH Council, *European FTTH Forecast 2008 -2013*, FTTH Council Conference Copenhagen, 10 February 2009

[9] G Finnie HeavyReading Consultants commissioned for FTTH Council, *European FTTH Forecast 2008 -2013*, FTTH Council Conference Copenhagen, 10 February 2009

[10] KPN another Dutch Telecommunications operator has recently stated that it does not yet have the intention to roll out FTTH on a large scale – March 2009

[11] Ovum Lyn Hutcheson, *FTTH/FTTB in Asia Pacific presentation*, 11 February 2009, FTTH Asia Pacific Conference 2009 < http://www.slideshare.net/ceobroadband/ftth-conference-2009-ftth-in-asia-pacific>

[12] Znet News, *NZ takes the dark fibre approach*, 27 February 2009, < http://www.zdnet.com.au/news/communications/soa/NZ-takes-dark-fibre-NBN-approach/0,130061791,339295185,00 htm>

[13] Znet News, *NZ to get NBN too,* 10 November 2008, < http://www.zdnet.com.au/news/communications/soa/New-Zealand-to-get-NBN-too/0,130061791,339293120,00 htm?feed=pt_broadband>

[14] Znet News, *NZ telco report rejects $1.5bn NBN*, 23 February 2009, < http://www.zdnet.com.au/news/communications/soa/NZ-telco-report-rejects-1-5bn-NBN/0,130061791,339295110,00.htm>

4.2. Greenfields roll outs

The Dundee City Council (Scotland) has announced it will use the city's sewer system to deliver high-speed broadband to every home and business. Fibre-optic cable capable of speeds in excess of 100 mbps is to be fed through the system at a cost of £30 million. The roll-out will cover at least 55,000 homes with FTTH.[15]

In NZ, Telecom Wholesale and WorldxChange have announced they will supply FTTH over an open access network in a new housing development in Orewa, north of Auckland (NZ). Kensington Park will be the first of 13 housing developments to get the service, with another 3,500 households expected to be connected over the next 24 months. Telecom Wholesale is trialling a service which will support download speeds of 30 mbps and upload speeds of 6 mbps.[16]

BT is trialling FTTH to 300 homes in Ebbsfleet, Kent (UK). Speeds will start at 2.5 Mbps with 'bursts' of 100 Mbps. BT has stated that while 10 Mbps will be the baseline minimum for customers, download speeds will increase depending on what the user is doing, such as downloading a movie. BT plan to offer FTTH to all 10,000 homes which are expected to be built at Ebbsfleet.[17]

4.3. International Themes

From the international literature the following themes emerge:

- A recent IDATE report (commissioned by the FTTH Council Europe) has found that it is not just incumbents rolling out FTTH. The report has noted that there are large numbers of alternative providers rolling out FTTH in Europe. According to the IDATE report municipalities and power utilities continued to initiate FTTH/B projects in 2008.[18] As at December 2008, municipalities and power utilities initiated 58.5% of FTTH/B projects, followed by alternative operators/ISP (27.2%), incumbents at 9.8% and housing companies and others at 4.7%.[19]

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[15] Graeme Smith, *£30m plan will turn city's sewers into a top-speed information highway,* 19 June 2008 accessed on The Herald website at: <http://www.theherald.co.uk/news/other/display.var.2350839.0.30m_plan_will_turn_citys_sewers_into_a_topspeed_information_highway.php >

[16] TVNZ, *Homes get new generation broadband* , 19 June 2008, accessed on the TVNZ website at: <http://tvnz.co nz/view/page/536641/1857262>

[17] BBC News, *Experts question BT's fibre trial,* 19 June 2008, accessed on BBC News website at: <http://news.bbc.co.uk/1/hi/technology/7448704.stm>

[18] IDATE commissioned by FTTH Council Europe, *FTTH European Panorama,* December 2008 – presentation Copenhagen 11 February 2009 < http://www ftthcouncil.eu/documents/studies/Market_Data-December_2008.pdf>

[19] IDATE commissioned by FTTH Council Europe, *FTTH European Panorama,* December 2008 – presentation Copenhagen 11 February 2009 < http://www ftthcouncil.eu/documents/studies/Market_Data-December_2008.pdf> slide 9

Based on the number of homes passed in European countries (December 2008), alternative operators represent 64.4%, followed by municipalities and power utilities at 17.9%, incumbents at 15.2% and housing companies and others at 2.6%.[20]

IDATE's report also found that the main European incumbents that are deploying, or will soon deploy, FTTH/B are: France Telecom (France), Telefonica (Spain), Telecom Italia (Italy), Belgacom (Belgium), KPN (Netherlands) and Swisscom (Switzerland). IDATE noted that other incumbents such as BT (UK) are still mainly positioned on VDSL.

- Despite there being a large number of non incumbents rolling out FTTH in Europe a recent WIK report has indicated that incumbents are better placed than alternative operators to invest in FTTH on a large scale as incumbents can make better use of economies of scale and scope due to their larger subscriber base compared to other competitors, which they can switch to the new NGA technology.[21] However despite this advantage, non incumbents, particularly utility companies with their own infrastructure have been able to make FTTH roll outs affordable in some geographies.

  WIK also found that investment in NGA can generate significant and sustainable first mover advantages. First mover advantages can limit the ability of second-movers to reach the necessary market shares for replicability and profitability.

- FTTH is cost effective in densely populated areas. A number of FTTH operations are already profitable.[22] In less densely populated areas FTTH roll out requires Government subsidisation. The cost of FTTH deployments are reduced as penetration rates increase.

- Service prices vary widely across geographies. A recent US Yankee Group report found that pricing in terms of downloaded megabyte (end user pricing) was highest for FTTN while FTTH/B and DOCSIS 3.0 prices are comparable.[23]

- An IDATE study found that HFC network upgrade amounted to 53% of FTTH capex per suburb.[24] The ACCC notes the cost of such an upgrade is likely to depend on the extent of the upgrade of the bandwidth and any segmentation.

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[20] IDATE commissioned by FTTH Council Europe, *FTTH European Panorama,* December 2008 – presentation Copenhagen 11 February 2009 < http://www ftthcouncil.eu/documents/studies/Market_Data-December_2008.pdf> slide.10

[21] WIK-Consult, *Study for the European Competitive Telecommunication Association (ECTA) The Economics of Next Generation Access- Final Report,* 10 September 2008 pp225-226

[22] Yankee Group Research, *Next Generation Access Services (Study of 20 service providers including TransACT)* 2008

[23] Yankee Group Research, *Next Generation Access Services (Study of 20 service providers including TransACT)* 2008

[24]Liberty Global IDate, *DigiWorld Summit 2007 Who should pay for FTTx VDSL v FTTH presentation* <http://www.bloobble.com/broadband-presentations/presentations?itemid=970>

- FTTH deployment payback ranges from 6 to 20 years.[25] While details surrounding the assumptions underpinning this finding have not been located ultimately, any pay back period will depend on a number of factors including the costs involved and the prices charged.

- Besides network technology/architecture factors and the costs of network elements, the profitability of FTTH roll out and replicability also critically depends on the ability of operators to generate higher Average Revenue Per User (ARPU) and or margins for services offered on NGA infrastructure. Sustainability of higher prices would be unlikely if upward substitution from existing xDSL services and competition from cable TV occurs.[26] One study found that NGA ARPUs are reliably 30% above DSL.[27]

- FTTH investment requirements are very much dependent on national specificities (eg low civil engineering costs in Portugal and renting ducts in the distribution cable segment in Italy instead of own investment).

- In order to facilitate competing fibre local loops, reduce costs and reduce multiple excavation and other civil works in municipalities, the sharing of existing ducts of telecommunications and cable companies (and also those of other utilities) may be an important policy requirement. The EU in their draft NGA recommendations view duct access as significant.[28] However a recent Ofcom report stated that duct access may be not always be the priority for access seekers and highlighted mixed views on the importance of duct access. It noted a BT survey which found "use of existing ducts may be more appropriate to support competition in FTTC deployments as opposed to FTTH given general limitations on the amount of usable duct between the cabinet and home."[29] Also KPN (Netherlands) do not see duct access as important as historically no ducts were used in the access networks.

- FTTH deployment results in end user benefits such as improved health and education services.[30]

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[25] Yankee Group Research, *Next Generation Access Services (Study of 20 service providers including TransACT)* 2008

[26] WIK-Consult, *Study for the European Competitive Telecommunication Association (ECTA) The Economics of Next Generation Access- Final Report,* 10 September 2008

[27] Yankee Group Research, *Next Generation Access Services (Study of 20 service providers including TransACT)* 2008

[28] Commission on the European Communities, *Draft Commission recommendation on regulated access to Next Generation Access Networks (NGA)* – consultation on draft ended 14 November 2008
< http://ec.europa.eu/information_society/policy/ecomm/library/public_consult/nga/index_en htm>

[29] Ofcom, *Delivering Superfast Broadband in the UK,* 3 March 2009, Section 7 – para 1.29

[30] Ovum, Study on the Socio-Economic Benefits of Fibre, 2007
<http://www.ftthcouncil.eu/documents/studies/Socio-Economics_Study.pdf>

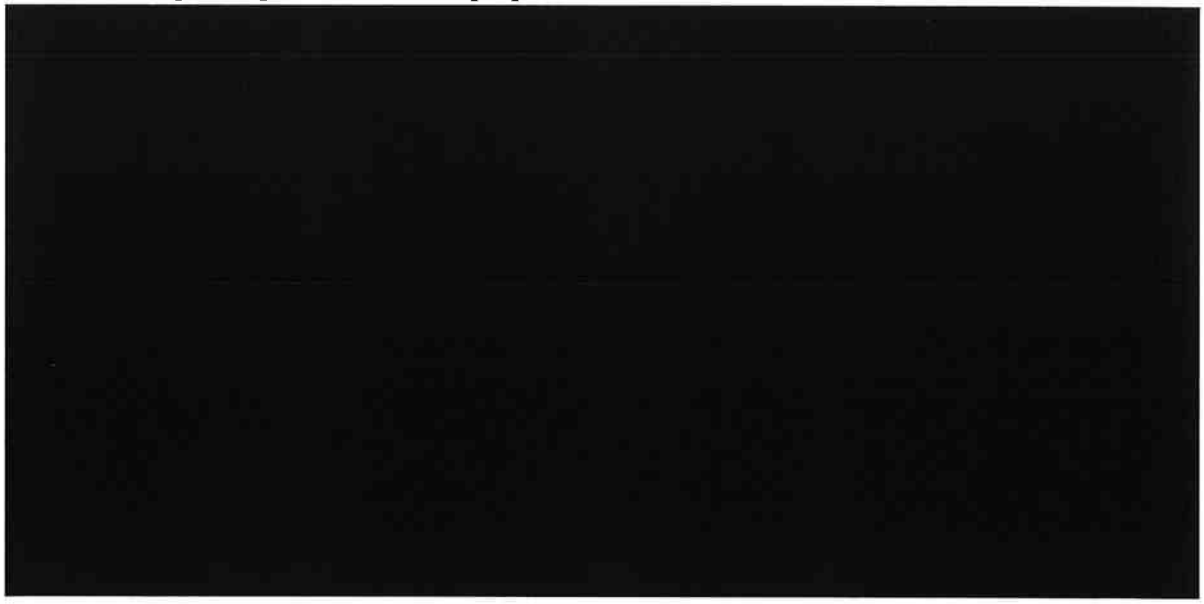
- WIK have found that FTTH requires roughly 5 times higher investments than VDSL. Furthermore the more future proof and open network friendly P2P FTTH architecture requires less than 10% additional investment than the PON FTTH architecture. However the ACCC question the reliability of this finding, significantly costs between P2P and PON are likely to differ. P2P will require a port to connect each dedicated fibre to the OLT whereas in PON only one port is required per group of customers.

- If the deployment of fibre is organised in a cost-efficient manner for example via aerial deployment, greater replication of fibre access seems to be possible than a duct/buried cable environment. Aerial deployment has lower civil engineering costs. If there are no existing ducts then aerial deployment will less expensive. Replication is also supported by ultra-high densities in Japanese cities.[31]

5. What is the Australian experience ?

5.1. Presence of FTTH in Greenfields and Brownfields

A small but growing number of new properties across Australia are connected with FTTH.



In May 2007, TransACT announced the rollout of a FTTH greenfields development in the community of Forde, which will provide download speeds up to 30 mbps and 10 mbps for uploads. FTTH services will be provided to more than 1,000 homes in the community by 2013.

Initiatives also being pursued by state governments in greenfields areas include for example:

- The Queensland Government – initiated Project Vista, which plans to bring a 100 mbps broadband service to Brisbane through a deployment of FTTH. The Queensland Government also has an agreement with Ergon energy to construct an

[31] WIK-Consult, *Study for the European Competitive Telecommunication Association (ECTA) The Economics of Next Generation Access- Final Report,* 10 September 2008 pp 226-227

optical fibre link built into new high voltage power lines on the Fraser Coast to boost broadband connections for the region.

- The Victorian Government – developed the Aurora project, which aims to deliver FTTH broadband services to approximately 8,000 residents in the Aurora estate in Melbourne's northern suburbs.[32]

The roll out of FTTH has mainly been seen in new developments, however there has been some developments of FTTH in brownfields. These brownfield developments are largely government led initiatives and include:

- Bright WA – project has been judged as not very successful as it cost $35 million to connect approximately 350 customers. The cost per home connected has been estimated at AU$2200 and
- Tasmania – Tasmanian Collaborative Optical Leading Test bed (TasCOLT) a pilot project which was deployed aerially using infrastructure owned by state owned utility Aurora Energy. The costs per property passed has been estimated at AU$1,800.[33]

5.2. FTTH Supply Chain

Many FTTH installations occur in new housing estates built by large property developers such as Delfin, Mirvac, Walker and Satterly. FTTH availability is often used by these developers as selling points for the estate. According to an industry source some network providers, including Telstra, insist that developers provide them with 'overbuild' protection to prevent duplication of their FTTH network. This period of exclusivity is typically for 10 years or more, although it may be lower in particular cases. Other providers, such as Opticomm, do not require overbuild protection.

Some developers have an exclusive relationship with Telstra for the supply of all their future fibre developments, including Multiplex and FKP. However other developers negotiate fibre connections on an ad-hoc commercial basis and some (typically when a State Government is involved) run open tender processes.

Once the agreement to provide services has been signed, the FTTH network provider has an obligation to provide fibre connections to end users and have services ready to be delivered as soon as residents move in. As developments come online in small increments of houses, the property developer typically pays a concession fee to the FTTH network provider to in effect compensate it for the period of time (perhaps 12-24 months) after installing the network before a sufficient number of customers move into the development to make the network profitable.

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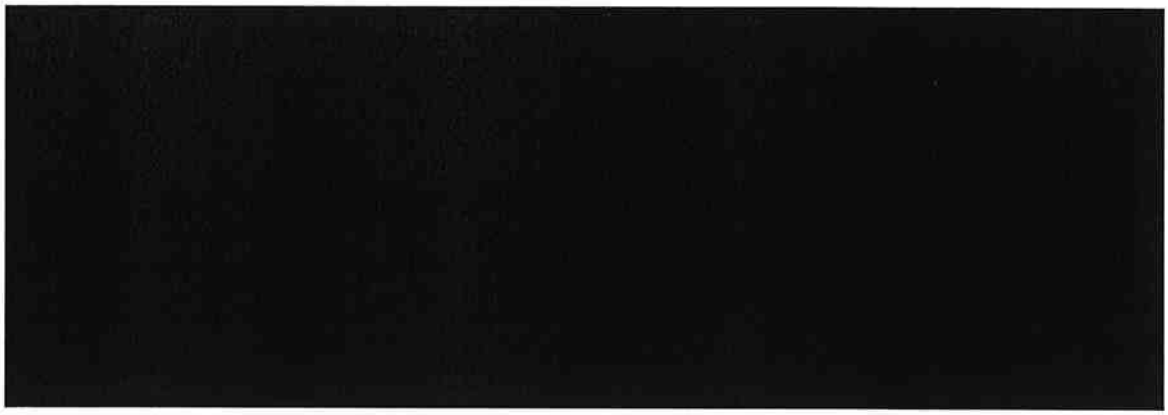
[32] DBCDE website, *An Industry Vision for the National Broadband Network Plan Supplementary Report* 30 March 2008, pp 62 <http://www.dbcde.gov.au/communications_for_business/funding_programs__and__support/national_broadband_network/submissions/FTTP_Special_Interest_Group.pdf>

[33] DBCDE website, *An Industry Vision for the National Broadband Network Plan Supplementary Report* 30 March 2008, pp 55 to 58 <http://www.dbcde.gov.au/communications_for_business/funding_programs__and__support/national_broadband_network/submissions/FTTP_Special_Interest_Group.pdf>



The developer builds the telecommunications ducts in which the optical network will be located and hands over ownership of these ducts to the FTTH network provider who then builds the optical network. Once ownership passes, the network provider has responsibility for ongoing maintenance.

The boundary of this network is the ONT at the customer premises and the fibre goes from this point to an optical splitter. The fibre in a particular development is taken to a nearby point of aggregation, often a small building or part of a building, where the fibre is terminated on OLT equipment and then connected to a backhaul link. By way of example, for one particular FTTH supplier, this backhaul link leads to a point of aggregation in the State's capital city and ISPs are able to interconnect to this point in order to provide retail services to customers in the FTTH supplier's estates.

It is interesting to note that no major ISPs other than Telstra and Internode offer retail services in FTTH areas. Opticomm, an FTTH provider recently finalised a deal with Internode whereby Internode will offer speeds of 25, 50 and 100mbps in a greenfields estate at Urban Pacific's Fernbrooke estate project in Brisbane. Internode will be able to deliver broadband and telephony services over Opticomm's wholesale fibre. This arrangement is in contrast to Telstra's "Velocity" program where services have remained retail only. Internode has reported that the cost of buying access to Opticomm's fibre "was comparable to operating a DSLAM in an exchange."[35]

In a brownfields scenario the supply chain will look different. With brownfields deployment it will be possible to achieve greater scale. With more potential revenue available this in turn will provide the potential opportunity for more suppliers and retailers of FTTH services to enter the market. Also customers in brownfields are likely to have more choice available to them. In brownfields some existing infrastructure may be utilised such as some of the existing ducts and cabling may be used along with some existing exchange buildings. It is also possible that existing power lines for aerial deployment may be used.

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[34]ACCC Meetings with Industry source, 11 December 2008 and 2 February 2009

[35] Communications Day, *Internode FTTH Costs Comparable to Copper,* 26 February 2009, Issue 3456

6. Costs for FTTH

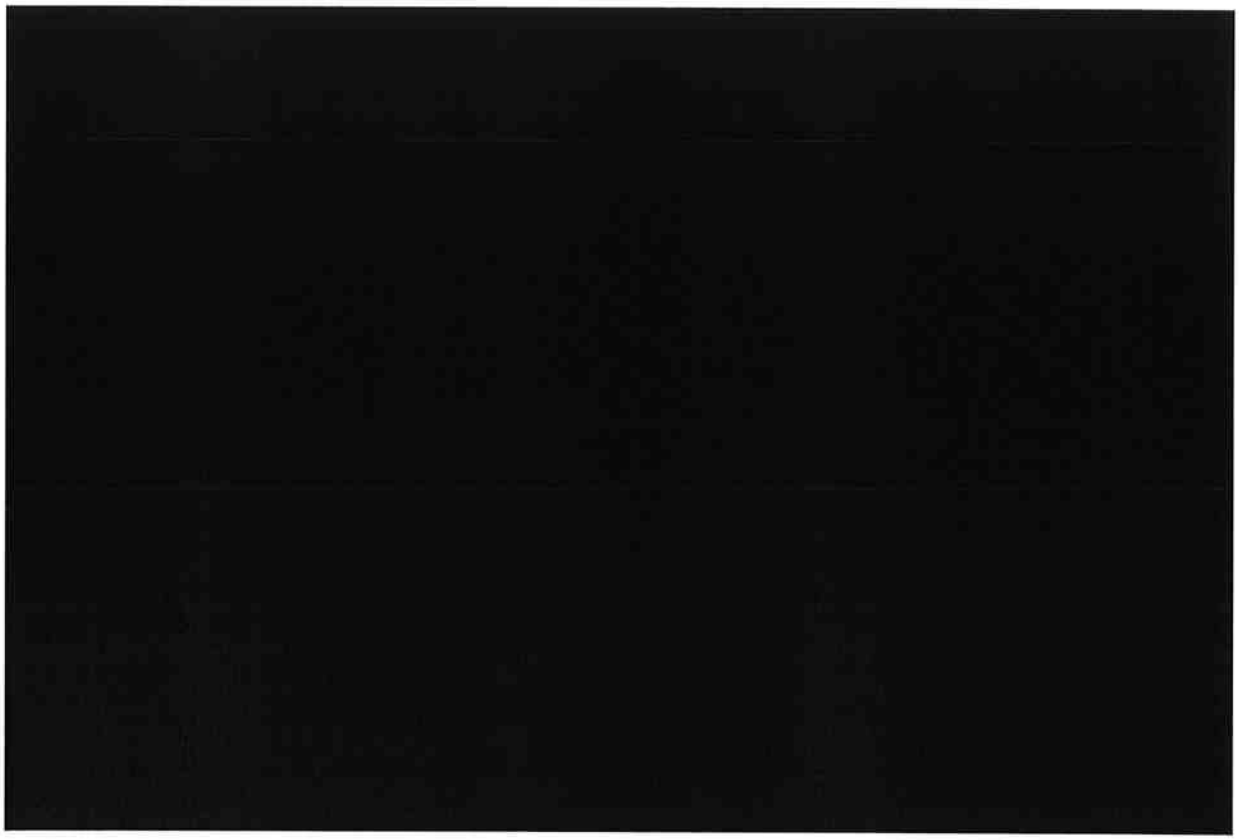
6.1. FTTH Costs Internationally and in Australia

There appears to be a wide range of cost estimates for deployment of FTTH available generally. This may have to do with different accounting methods, extent of network coverage, national specificities, supporting infrastructure and technology used.

A FTTH network can be expected to have lower operating expense than an FTTN for a number of reasons including:

- for an FTTH network the customer supplies all the power to run the ONT, not the carrier.
- all active components are located either in the carrier's premises or the customer's premises, not out on the streets.
- optical fibre is much more tolerant of lightning and water than is copper cable and generally costs less to maintain.

The greater capex of FTTH compared to FTTN (for a brown fields construction) is offset to some extent by its lower opex.



Australian cost estimates for FTTP per premise vary significantly from **[c-i-c]** $489[36] to $2,500[37] **[c-i-c]**. The table at **Attachment 4** provides some estimated costs for FTTH

[36] Ovum 2007 FFTP figures give a range per premise from **[c-i-c]** $489 to $889 **[c-i-c]** see Attachment 4

deployments in Australia and provides some comparison to FTTN. Analysys, provide an estimate that civil works comprise **[c-i-c]** $8b**[c-i-c]** out of a total of **[c-i-c]** $14b**[c-i-c]** FTTH costs to reach approximately **[c-i-c]** 50% **[c-i-c]** of the population.

By way of international comparison an industry report to DBCDE has found that US Verizon's FTTH deployment costs in the year 2007 were "US$325 per home passed and US$850 per home connected including active optics and electronics based on a 60% aerial 40% under ground spilt."[38]

A recent WIK report provides a comparison of European investment per home connected across FTTH PON and FTTH P2P architectures. For PON FTTH the investment per home connected ranges from $1,110 Euro ($AU 2,140) to $2,039 Euro ($AU 3,940). For P2P FTTH the investment per home connected ranges from $1,160 Euro ($AU 2,240) to $2,111 Euro ($AU 4,075).[39] WIK state that the wide range provided may be partly explained by national specificities which alter investment requirements.[40]

Ovum suggests that maturity assists in reducing fibre deployment costs. In Japan, where there have been extensive deployments of FTTH and FTTB, the cost per home in 2007 was around **[c-i-c]** US$1,350 **[c-i-c]**. [41] In comparison to the Japanese experience, French costs to install FTTH are very high. Ovum estimates that during 2007 the cost per premises passed by French Telecom was **[c-i-c]** US$2,926 **[c-i-c]**. [42]

Many European and Asian countries where FTTH has been deployed are very densely populated areas and this density factor will make their FTTH deployments cheaper than they would be in Australia. However it is noted that there are different measures of density and Australia has an extreme range with some highly concentrated urban centres and sparsely populated rural areas. Due to lower population density in Australia in rural areas an Australian roll out of FTTH is likely to have higher civil engineering costs due to the lower customer base available. Labour costs, equipment (such as OLT's with fewer ports) and backhaul network costs are all likely to be higher in rural areas compared to more densely populated urban areas. [redacted]

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[37] Analysys 2006 FTTP figures total cost per premise at **[c-i-c]** $2,500**[c-i-c]** see Attachment 4

[38] DBCDE website, *An Industry Vision for the National Broadband Network Plan Supplementary Report 30 March 2008,* p.22 <http://www.dbcde.gov.au/communications_for_business/funding_programs__and__support/national_broadband_network/submissions/FTTP_Special_Interest_Group.pdf>

[39] WIK-Consult, *Study for the European Competitive Telecommunication Association (ECTA) The Economics of Next Generation Access- Final Report,* 10 September 2008 p xvi

[40] WIK-Consult, *Study for the European Competitive Telecommunication Association (ECTA) The Economics of Next Generation Access- Final Report,* 10 September 2008 p.xvii

[41] Ovum, *FTTx Regulatory Triannual Monitoring Reports: Report No.*3 (A report for the ACCC), March 2008, p.4.

[42] Ovum, *FTTx Regulatory Triannual Monitoring Reports: Report No.*3 (A report for the ACCC), March 2008, p.25.

To date FTTH has not typically been rolled out to rural regions as other technologies have been seen to be cheaper and more suited to less densely populated areas. However it appears that FTTH has been in favoured in some countries over other technologies where subsidies are provided for rural areas. For example the recently signed US Stimulus Package provides for $7.2 billion for broadband development in the US with $2.5 billion allocated for subsiding FTTH development in rural areas. The grants provided must all be disbursed by 30 September 2010 and those receiving them have two years to build out infrastructure. There are also currently small pockets of rural FTTH development in Vermont and Indiana in the US.[43]

In Sweden, although a good deal of its fibre is present in dense urban areas such as Stockholm, "a significant amount is also located in small rural towns in remote areas, some of which can boast regional penetration rates of more than 90%. In rural areas of Sweden, Emtelle has been rolling out FTTH supported by Government funding. In sharp contrast, 30% of the EU's rural population has no access to broadband at all."[44]

7. FTTH and the interaction with existing regulation

7.1. Current Declarations

There are three ACCC declarations which may apply in FTTH areas, the PSTN terminating service, the PSTN originating access service and the Domestic Transmission Capacity Service (DTCS).

The PSTN terminating service applies to 'An access service for the carriage of telephone (i.e. PSTN and *PSTN equivalent* such as voice from ISDN) calls…'. This prevents a FTTH service provider from charging other carriers higher rates to terminate telephone calls in relevant areas. The PSTN originating access service may also apply as the service is defined as an access service for the carriage of telephone (ie PSTN and *PSTN equivalent* such as voice from ISDN) calls.

The generic service description for DTCS being a 'service that can be used for the carriage of voice, data or other communications using…broadband carriage (minimum bandwidth …2mbps)' which includes regional and tail end transmission does apply to FTTH areas. However it is unclear if the declaration will apply to services provided off a FTTH network as the declaration appears to only cover G.703 interfaces[45] not Ethernet interfaces, which are the more commonly used interfaces in FTTH. With the change to IP networks, Ethernet interfaces are now cheaper than G.703 and hence are mostly used for FTTH.

The ACCC understands based on the technology and the service description, that the Wholesale Line Rental (WLR) service does not apply to FTTH deployments and,

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[43] Broadband DSL reports.com, *Indiana Telco To Deploy Rural FTTH*, 29 April 2008< http://telephonyonline.com/fttp/news/rural-fttp-economical-0429> and < http://www.dslreports.com/shownews/Indiana-Telco-To-Deploy-Rural-FTTH-93405> 8 April 2008

[44] Ovum Straight Talk, *FTTH in Europe : green shoots need water*, Charlies Davies, 19 February 2009

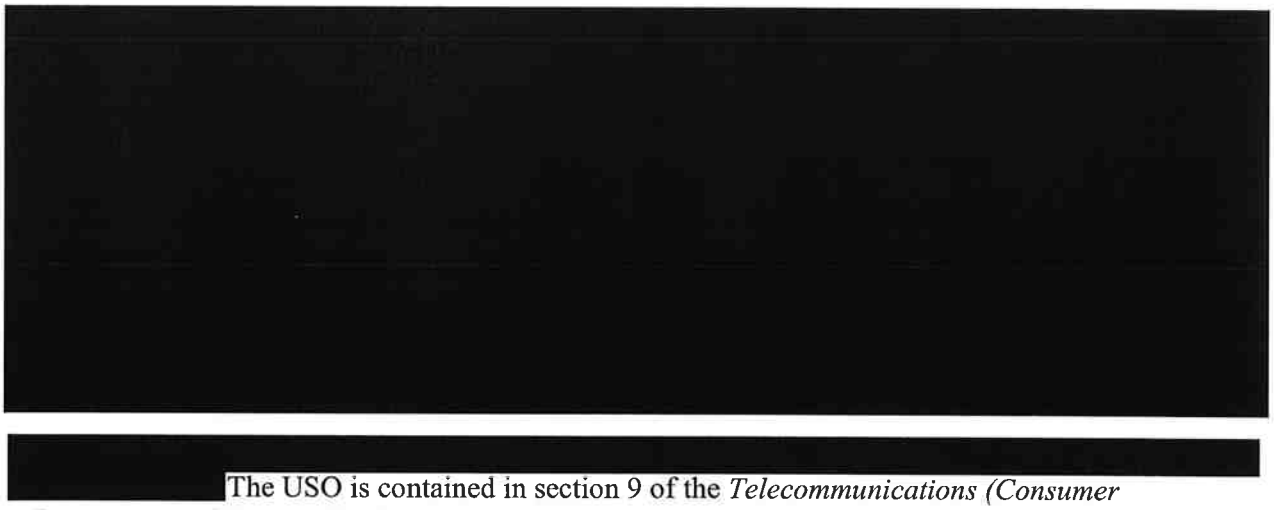
[45] G.703 is a recommendation from the ITU-T covering Pleisiosynchronous Digital Hierachy interfaces.

consequentially, Telstra is not required to provide WLR access in areas where it utilises FTTH technology. This is because the WLR service description permits connection to the 'carrier or carriage service provider's public switched telephone network' and the VoIP technology used by Telstra in its end to end fibre developments is not a PSTN service.

Neither the Unconditioned Local Loop Service (ULLS) nor the Line Sharing Service (LSS), Local Carriage Service (LCS) are relevant to the supply of services over an end to end fibre network. However this raises the issue as to whether some form of unbundled fibre access service would be warranted. As noted below, Japan is allowing access to unbundled fibre down to groups of 8 customers but not individuals.

7.2. USO

Issues around the scope of services, scope of consumers covered and the funding arrangements for a USO may need to be reviewed in the context of any future FTTH roll out. The objective of the USO has been to ensure that all Australians have reasonable access, on an equitable basis to a 'standard telephone service'.[46] There is currently no USO in relation to high speed broadband services.



The USO is contained in section 9 of the *Telecommunications (Consumer Protection And Service Standards) Act 1999* and states:

> (2) To the extent necessary to achieve the obligation mentioned in subsection (1), the universal service obligation includes:
>
> (a) the supply of standard telephone services to people in Australia on request; and
> (b) the supply, installation and maintenance of payphones in Australia; and
> (c) the supply of prescribed carriage services to people in Australia on request.

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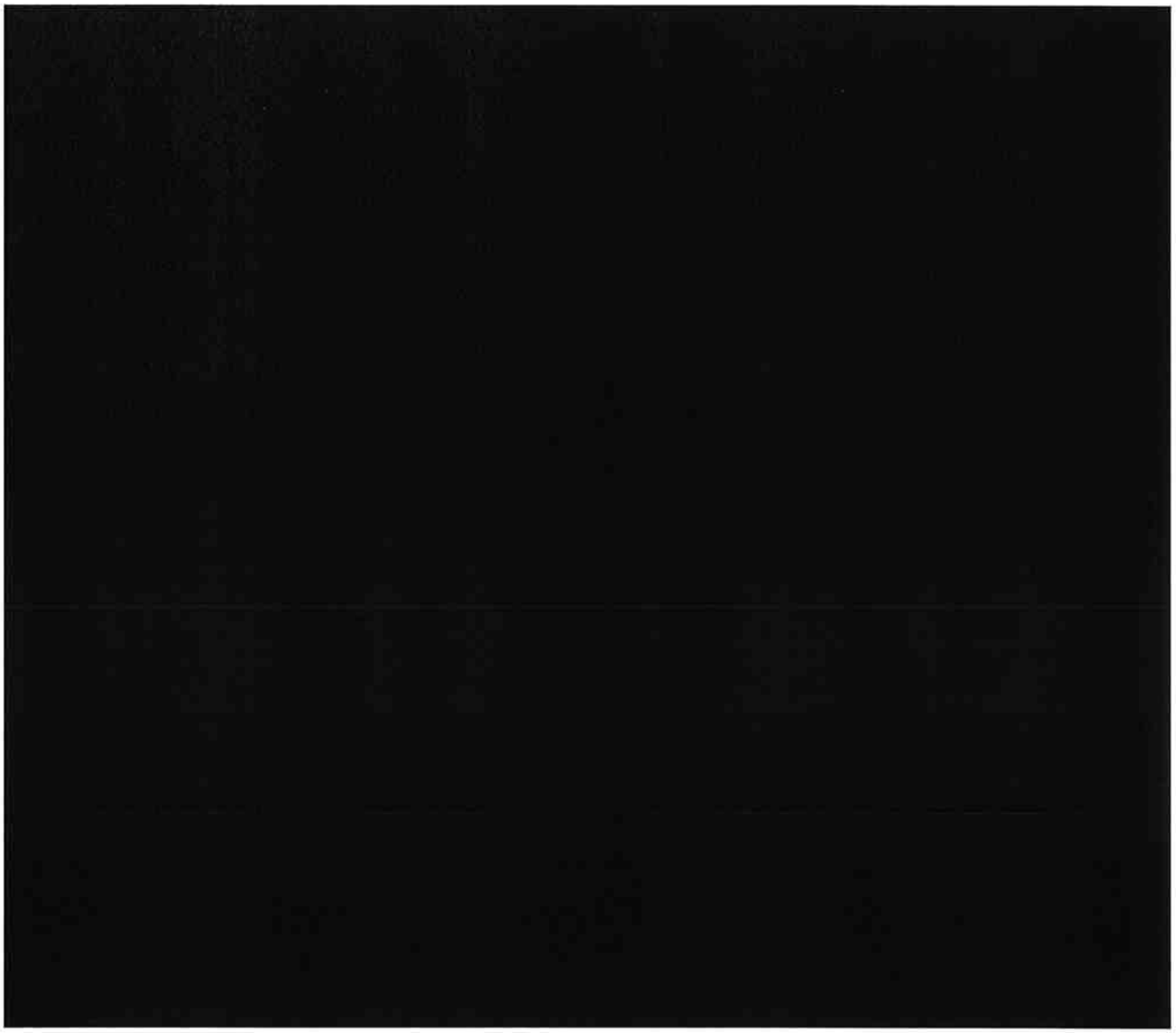
[46] The main object of the "universal service regime is to ensure that all people in Australia, wherever they reside or carry on business, should have reasonable access on an equitable basis to:

(a) standard telephone service;
(b) payphones;
(c) prescribed carriage services; and
(d) digital data services." s.8 of the *Telecommunications (Consumer Protection and Service Standards) Act 1999*



7.3. Emergency Services

In a FTTH network, the ONT is usually plugged into the mains power. Hence there is no requirement for a local battery to be placed at the ONT at the customer's premise. However in the event of a power failure the phone service may not operate. The obligation is on the customer to either install and maintain a battery in the event of a emergency or have an alternative communications means such as a mobile. The international experience has also been that the obligation rests with the customer to ensure that power is available for the phone to operate. It has been found that it would be too costly for an operator to maintain local batteries at the customer premise and may increase the cost of providing services. As Australian regulation currently stands a provider of FTTH only has to provide that the technology is capable of allowing emergency services to be made and it is up to the customer to maintain the battery.

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[47]Telstra, *Universal Service providing telecommunications services to Australians*, November 2007 p.17 http://www.dbcde.gov.au/__data/assets/pdf_file/0009/81567/Telstra.pdf

ACMA pursuant to s376 of the *Telecommunications Act 1997* has the power to make technical standards about customer equipment and cabling. ACMA currently regulates these arrangements through the *Telecommunications Labelling (Customer Equipment and Customer Cabling) Notice 2001*. These standards inter alia seek to ensure that customer equipment can be used to give access to an emergency call service. ACMA recommends that telephones be able to support access to emergency numbers (such as 000) for at least 30 minutes during a power failure. For telephones that do not function during a power failure the technical standard suggests that a warning notice be included in the instructions, advising users that the phone will not operate if there is a power failure.

In order to ensure that the emergency number can not only be technically dialled, but will practically work in an emergency, ACMA could (in addition to requiring a warning notice on the phone) pursuant to its Customer Equipment Standards provide that any battery provided to a customer must have at least a 15 hour battery life. With a FTTH network the ONT may include a local battery (with an extended life) if the customer wishes to be protected from local power failures.

7.4. Access to ducts and facilities

The importance of access to ducts will depend on the way FTTH is deployed. Duct access may be required for brownfields where all or part of the fibre used for the FTTH network is deployed underground. For greenfields deployment, new ducts must be built.

Access to buildings (such as exchange buildings) may not be necessary as the equipment for FTTH can be housed in small inexpensive buildings where no power supply needs to be maintained.

Access to ducts and other facilities is currently covered under arrangements under Schedule 1, Part 5 of the *Telecommunications Act 1997.* Also the current *Code of Access to Telecommunications Transmission Towers, Sites of Towers and Underground Facilities* (the Code) allows for access to underground facilities. The duct access regime as it currently exists leaves negotiation of access to the parties, with the ACCC as the arbitrator of last resort regarding disputes over terms and conditions of access. The ability of this process to achieve timely access to ducts will depend on the nature of the dispute notified.

Where a dispute relates to the technical feasibility of proposed access, resolution is relatively efficient: the first carrier must apply to ACMA for a certificate stating that the proposed access is not technically feasible. The first carrier is required, at the request of the second carrier, to apply for this certificate within 15 days of receiving the application for access[48] and ACMA must use its best endeavours to make a decision within 10 business days of this application.[49]

[48] Cl 2.3 Annexure B, Facilities Access Code

[49] Cl 35(5) Schedule 1 *Telecommunications Act 1997*

[50]Telstra website, Duct Access page < http://telstrawholesale.com/products/facilities/duct-access htm>

It is possible that FTTH could be deployed (in greenfields/brownfields) in part or in full, aerially along the power lines. If aerial deployment is undertaken then access would need to be gained from commercial agreements with the electricity pole owner as access is not specifically covered by the *Telecommunications Act 1997* or the Code. It is noted that there may be local council obstacles to obtaining permission for aerial deployment of cables if the deployment is viewed as a 'degradation of environmental amenity'. The Code also states that co-location of facilities should promote environmental amenity and notes the where possible carriers should deploy facilities in ducts to avoid any adverse impact on amenity.[52]

8. Is Regulation of FTTH required ?

8.1. Do these networks exhibit characteristics that necessitate regulation?

The recent policy approach to encouraging competitive markets has been access regulation. The process can be identified as firstly, identifying with some precision what the nature of the natural monopoly (often referred to as the 'bottleneck') is[53] and secondly, having identified the 'bottleneck' in question, the next step is to apply some form of regulatory constraint relating to both the price and non-price elements of access. [54]

The international FTTH experience indicates that a technical bottleneck is likely to exist at the bitstream service layer two of the network (ie the service provided by the FTTH access network). The physical medium for an FTTH network is a shared optical fibre. At the network end the fibre terminates in an OLT, and at the customer end in a number of ONTs (one per customer). It is not expected that there will be multiple OLTs for the one shared optical fibre. The sharing of the capacity on the shared optical fibre between the various customers and security of communications is managed by the protocols used and is usually managed by a single party. Consequently, it is only viable to have a single operator for the physical layer (the optical fibre) and the layer above that (ie the OLT and ONTs) which send and receive the optical signals unless there is separate fibres end to end. That operator then provides a bitstream service to the party that provides the various services to a particular customer. The bitstream service can be either from the network side of the OLT or from further back into the network where greater traffic concentration may make interconnection more cost-effective. That is, the shared optical fibre and the necessity of having it operated by a single party (for sound technical reasons) is a bottleneck which needs to be managed from a competition perspective. FTTH like a HFC network would be difficult to unbundle at the physical

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[51] Telstra website, Duct Access page < http://telstrawholesale.com/products/facilities/duct-access htm>

[52] The Access Code p.98 – reference to the *Telecommunications Bill 1996 Second Reading Speech* p.8

[53] This involves consideration of what substitute services users can turn to (eg, to what extent do wireless broadband services have the service qualities that consumers need/want if they could not afford fixed-line services?) and what the Australian Competition Tribunal has referred to as the 'minimum bundle of assets' a competitor would need to acquire in order to be able to replicate the incumbent's service offerings.

[54] Due to the highly capital-intensive nature of infrastructure industries virtually all approaches focus on (a) the value of the relevant asset base (the minimum bundle of assets required to provide the services) and (b) the cost of the capital required to fund it (WACC)

infrastructure layer to a ULLS like product. However it is noted that some EU telecommunications companies such as Swisscom are allowing access to last mile fibre into the home by running four fibres into the home and allowing access to three.[55] In Japan shared access to the PON is occurring whereby the architecture appears to be EPON with 4 groups of 8 fibres thereby allowing unbundling down to groups of 8 customers.

Indications of a potential technical and economic bottleneck at the layer 2 bitstream service (as seen internationally) may lead to a conclusion that some form of regulatory constraint of new FTTH markets may be required. That said, given the infancy of FTTH in Australia it is difficult to determine the extent and nature of any economic bottleneck without further consideration of a number of factors including the strength of alternative networks.

[redacted]

The ACCC understands that the situation faced in Australia where one operator controls both the copper wire network and the cable network has not been allowed to occur in the US.

In determining the necessity for regulation, market definition is an integral part of analysing competition in a market as it provides the ACCC with a field within which it can meaningfully analyse the effectiveness of competition. The level of contestability will differ as the economics of FTTH networks is likely to vary across different geographies. In some geographies (such as brownfields metro areas) the access network may be more replicable than in others. The question then arises will the competitive conditions of different geographic areas be similar enough to justify including them as part of the same economic market?

There appears to be evidence of contestability *for* greenfields markets in Australia as noted in section 5. Brownfields deployments are only in trial stages however it appears that there might be potential for competition *within* the market as indicated by the degree of substitutes available in high density areas where telecommunication services already exist. [redacted]

[55] Yankee Group presentation, *Opening the network makes economic sense*, NZCC Broadband at a crossroads NGN conference, 27 February 2009

Within greenfields FTTH, the ability for demand or supply substitutability within that geographic area appears very limited. In its thinking on greenfield sites issues to date, the ACCC has generally adopted a position that competition among network providers to supply services to property developers represented a form of competition *for* the relevant local telecommunications market which may compensate for the lack of competition *within* the market. It is hoped that property developers would be wary of signing up for FTTH network deals that result in the residents of their estates paying a significant premium for telecommunications services compared to usual market rates as this might hurt property values.

8.2. Narrow market definition

The greenfields market may be defined as the supply of fixed line services in greenfield estates. Similarly the brownfields market may defined as the supply of fixed line services in a particular region of Australia.

However (apart from the recent WLR/LCS/PSTN OA exemptions), the ACCC has not usually adopted narrow market definitions of this type with respect to the supply of telecommunications services, despite the lack of supply side substitutability for fixed line services to a customer in a particular geographic area. The reason for this is that telecommunications services are usually offered on a national basis with relatively uniform geographic pricing which indicates that service providers do not compete on such a narrow geographic basis.

8.3. Broader market definition for greenfields FTTH deployments

A more appropriate greenfields market definition may be a market for the supply of services to customers in FTTH greenfields developments nationwide. Three main factors may indicate that this market is distinct from the supply of fixed line services over Telstra's copper network:

- As shown in **Attachment 3**, FTTH service plans, in particular those for broadband internet, on the whole differ from copper fixed line services in terms of price and product characteristics. These differences may increase in the future if existing fibre networks become upgraded for higher speeds.
- Developers are willing to pay a premium (in the form of concession payments and head-works fees) to have estates connected with FTTH and this premium is presumably passed on to property owners.
- This market has unique supply-side characteristics; while some ISPs that offer services over the traditional copper network may have the capability to deploy fibre in greenfield sites (including Telstra and TransAct), these are different skills and many of the providers building FTTH networks are not involved in the copper network.

8.4. Broader market definition for brownfields FTTH deployments

In the brownfields FTTH scenario, the market for the supply of fixed services nationwide may be more appropriate.

However whether this definition is in fact the most accurate will depend on a number of factors including whether FTTH brownfields services are substitutable based on price and product offering with other services such as HFC, ADSL or wireless.

The degree of substitutability has been canvassed extensively in other regulatory decisions. For most small businesses and residential customers in a brownfields scenario wireless and fixed voice and data services are likely to be substitutable to some extent. These customers may be unlikely (in the immediate future) to use highly data intensive applications or require highly reliable data services and in many cases would be satisfied with 'best efforts' service provision. Accordingly customers in brownfields at the moment may be expected to readily substitute fixed (such as ADSL, FTTH, HFC) and wireless broadband for some services (such as email browsing but not large downloads). However the demand for intensive applications may change and may then alter the degree of substitutability.

In contrast medium to large business customers are likely to use high speed data applications (eg video conferencing), symmetrical data services and may require higher capacity and greater quality of services. These services are more likely to require the higher data speeds which are usually at this stage only achieved on fibre networks. Hence for these customers wireless and fixed data and voice services are more likely to be complements with wireless used to achieve mobility where needed.

HFC fixed networks are capable of achieving speeds comparable with FTTH. In the future, if IPTV applications are to be viewed as high demand applications, HFC has a further advantage. As well as the very high data rates available from HFC using DOCSIS 3 (for broadband TV), the HFC network also has many TV channels available for use. Where any of the video content is shared between a number of customers, DOCSIS 3 can be saved for other broadband applications.

Given that brownfields FTTH in Australia is only in trial stages no resolution is possible on the precise degree of substitutability that will be available between FTTH and other technologies. The boundaries for any relevant market definition will always be a question of degree and it will depend on the particular context being considered.[56]

[redacted]

The ACCC's approach to new networks in the past, may provide some guidance on how a new FTTH network may be considered. By way of background, Telstra's copper PSTN network and the two HFC networks (Optus and Telstra) were already in place at the time of the introduction of the regulatory regime (1997). However the initial deemed declared services were all determined by reference to services provided from the CAN that Optus was purchasing from Telstra. As Optus was not buying any HFC services from Telstra there were no declared HFC access products at that time which were akin to the telecommunications declared services for the copper.[57]

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[56] *Re Tooth & Co Ltd (1979) ATPR 40-113 at 18196-197*

[57] There was however a broadcasting access service which would apply to HFC provision of TV services however this was later declared invalid by the courts.

During the Local Services Review (July 1999) it appears that the ACCC was not minded to declare a ULLS type product supplied over the HFC as:

- at the time there was not sufficient demand for access (rather the demand focussed on DSL over copper and DSL could not be used over the HFC) and
- that unbundling the physical infrastructure for a ULLS like product would be difficult.[58]

Unlike the HFC experience of the past, if FTTH was to built, there is likely to be growing demand for access to high bandwidth services which can be offered over both the HFC and FTTH networks. Given the difficulty of unbundling FTTH at the physical layer, the most logical access point is likely to be at the bitstream service layer.

A number of considerations would need to inform any decision to bring FTTH within the scope of a future declaration:

- Whether access regulation would discourage investment in FTTH networks.
- To what extent regulated access charges should be different in FTTH areas from regulated copper access network prices. This is especially relevant if access charges are based on cost modelling of the existing copper network or a future FTTH network.
- Whether FTTH represents an additional service for particular housing estates (similar to shared recreational facilities or additional security services) for which potential residents should be free to decide whether they wish to pay a premium. On this conception of the issues, any potential concerns relating to anti-competitive pricing in FTTH areas should be addressed through ensuring full disclosure of the situation to potential purchasers.
- The extent to which wireless services should be considered adequate substitutes for fixed line services in FTTH areas will also be important.

If regulation is considered appropriate another factor to consider in determining the necessity of regulation is the business model and structure adopted by the FTTH operator as this is likely to impact on competition. Where a FTTH operator is vertically separated then a more light handed approach to regulation is likely to be more effective in promoting competition. Whereas if an operator is vertically integrated, greater regulatory constraint is likely to be required to counter the operator's incentives to favour its own downstream retail businesses.

9. Are there emerging competition and consumer concerns?

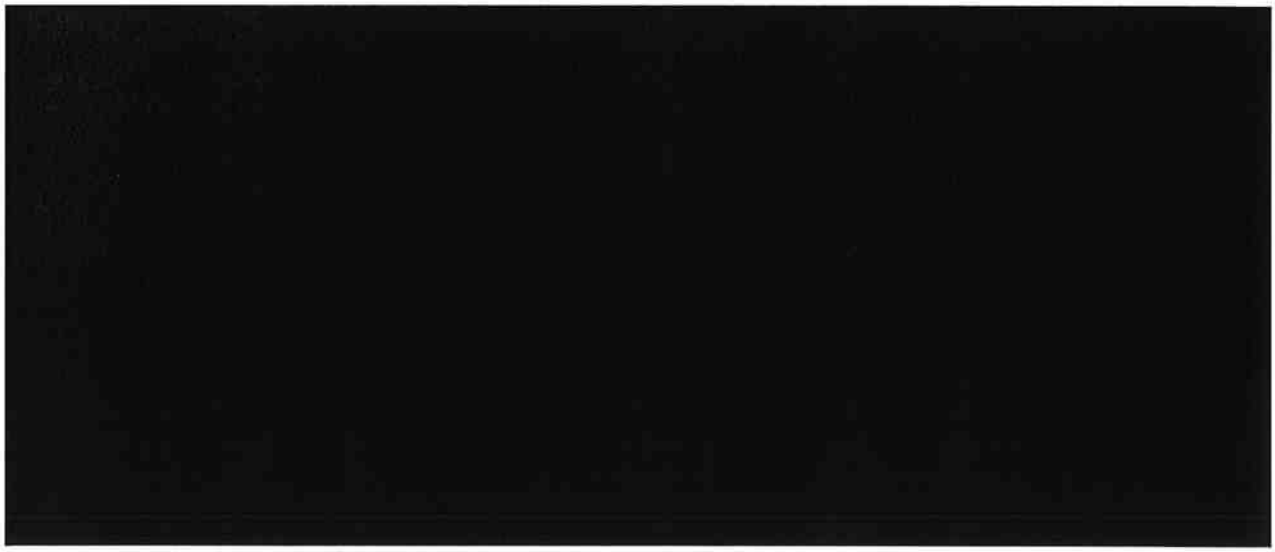
Given the infancy of brownfields FTTH deployments in Australia, this section primarily focuses on the competition issues arising in the greenfields FTTH context.

9.1. Pricing

The enquiries that have been made to date suggest that customers in FTTH developments are not necessarily being offered attractive pricing for internet services (**Attachment 3**). [redacted] Customers do not necessarily

[58] ACCC, *Local Services Review 1999* – Section 3.4.1 pg 15

receive a significantly better service for this premium either, with the Velocity internet service operating at ADSL1 (8000/384 kbps) or ADSL2+ (20000/512 kbps or 20000/1000 kbps) equivalent speeds.



Other service providers in FTTH estates offer a variety of retail prices, some of which are above market ADSL2+ retail rates. Arise's retail plans would be equivalent to moderately good value ADSL plans (for speeds of between 1mbps and 10mbps symmetrical). Service providers offer a wide variety of speeds but all are well below the theoretical benchmark FTTH speed of 100mbps (with the exception of Internode's 100mbps packages).

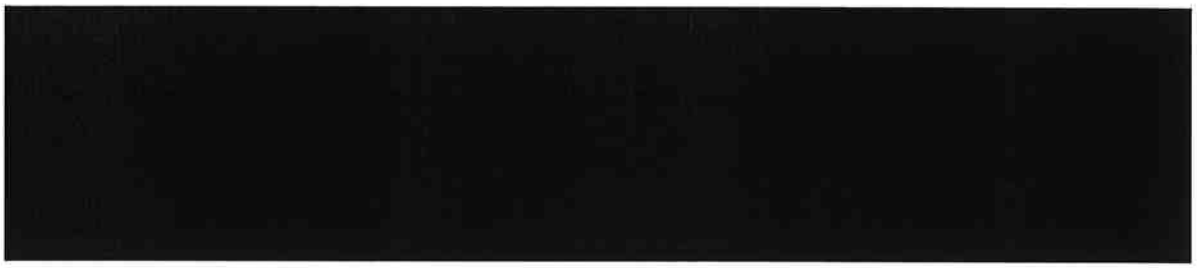
It is likely that, at the moment, the cheapest way of supplying fixed line telephone and broadband services to end users in new estates is through FTTN using low-end CMUX cabinets and minimal backhaul.

While the fibre network is significantly cheaper to maintain and the optical fibre itself is cheaper than copper wire, there are a number of elements in a FTTH network which may make the network more expensive to build overall even in a greenfield environment and this may explain the higher pricing. These network elements include the ONT, the optical splitter, TV signal translator and optical line termination equipment.

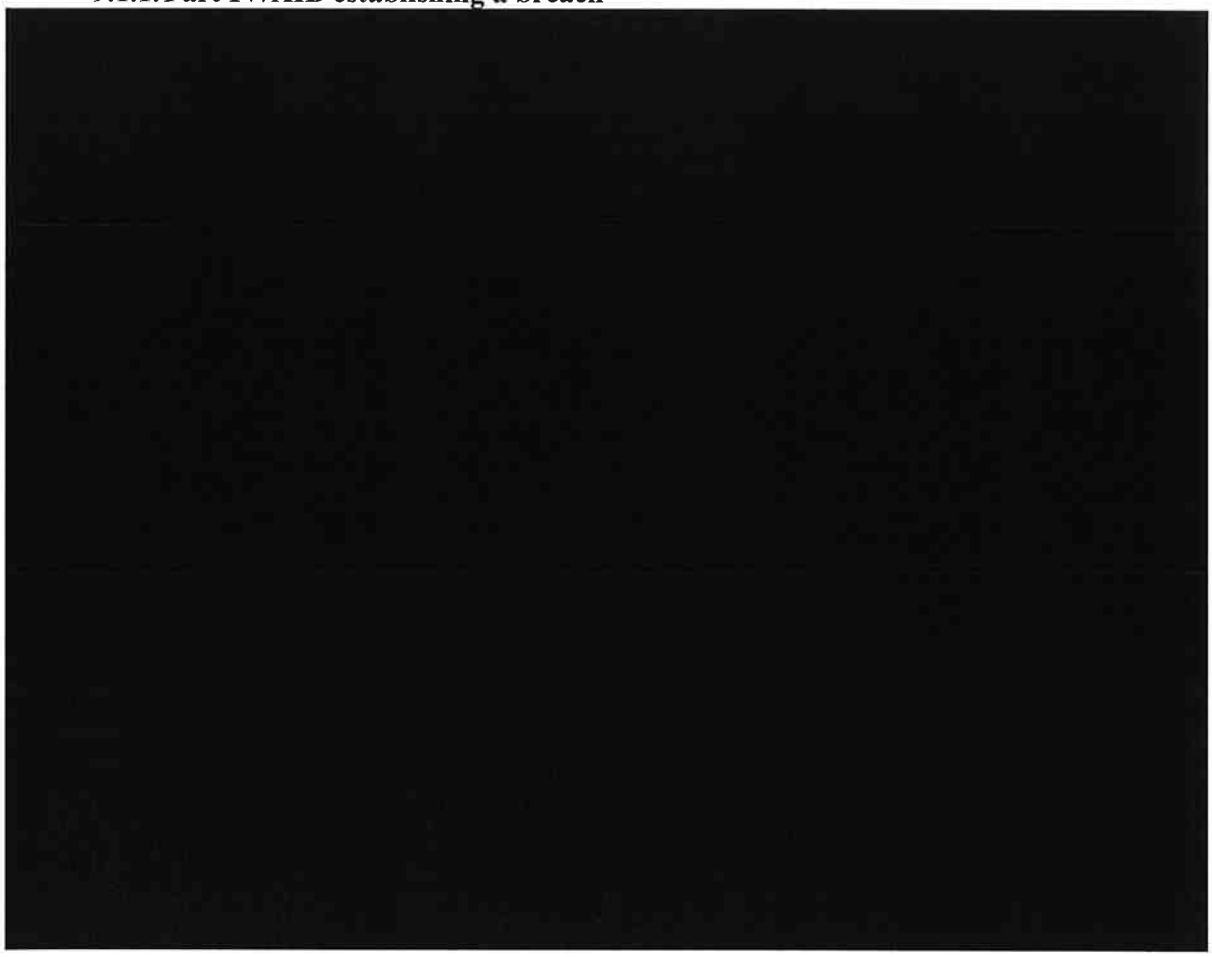
However, it is not at all clear that these additional capex costs justify a $20-$40 per month per customer premium for broadband services compared with copper line broadband. This is especially so given the existence of the per-premise concession payment that is paid by

developers and the fact that the provider operates an unregulated monopoly for fixed line services, resulting in less demand risk. Further, many of these developments are in outer suburban or more remote regional areas, meaning that potentially substitutable wireless services may be less available to customers.

With respect to smaller operators, it is difficult to conclude that the sometimes high retail prices in some cases compared to non-FTTH equivalents reflect monopolistic pricing. They may instead reflect inefficiencies due to a lack of economies of scale or inexperience in greenfield network development.



9.1.1. Part IV/XIB establishing a breach



[59] Per *Queensland Wire Industries Pty Ltd v Broken Hill Pty Co Ltd* (1989) 167 CLR 177

[redacted]

9.2. Issues around disclosure

There appears to be a common theme to complaints received by forums such as Whirlpool by residents in FTTH greenfields estates. That is customers are not aware of the high prices and lack of choice of services in their residence. While complainants are usually aware that they are moving into a fibre community of some kind, a common complaint is that they were unaware that this meant that their fixed line services offerings would be so different to that in most other parts of Australia.

[redacted]

9.2.1. Part V - establishing a breach

[redacted]

With regards to the very small amount of brownfields FTTH deployment, there has not been any evidence which the ACCC is aware of relating to any Part IV or Part V conduct.

Attachment 1 –Snapshot of International Regulatory Approaches

EU – initial regulatory restraint

On the whole, the initial approach in Europe has been to see how FTTH markets develop before imposing regulation. All the European jurisdictions show some degree of regulatory restraint: that is, they will first observe how the markets are developing.[60] According to Ovum this approach has been taken as **[c-i-c]** "the major evolutionary changes that NGN and next-generation access entail do not allow clear definitions of products and services to be defined up front: they have to evolve through discussion, negotiation and agreement." **[c-i-c]** [61] The common assumption in Europe is that **[c-i-c]** *ex-ante* regulation should only be undertaken in those cases where there is a clear case for regulatory intervention. **[c-i-c]** [62]

It appears that by the end of 2007, bitstream access in broadband wholesale markets had been mandated for more than half of the EU members.

The EU Commission has released the review of the EU Regulatory Framework for Electronic Communications Networks and Services.[63] Overall, the changes proposed in the review have not been substantial. There has been no inclusion of any potential regulatory holiday for incumbents rolling out fibre networks. The review suggested changes in the areas of spectrum management and streamlining market reviews, among other things. The EU Commission decided that the 'net freedoms'[64] identified by the US Federal Communications Commission (FCC), are not appropriate for inclusion in legislation in EU member states. Instead, the EU Commission believes that open and competitive markets together with the current EU framework, will be enough to protect 'net freedoms'.

The EU Commission also proposed that National Regulatory Authorities be given the power to set minimum quality levels for network transmission services in a NGN environment based on technical standards identified at the EU level. This is due to the Commission identifying that, while the framework does not allow operators in a dominant position to discriminate between customers in similar circumstances, there is a risk that the quality of service could degrade to unacceptably low levels. [65]

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[60] Ovum, *Bitstream and Voice Services in a Next Generation Network A report to the ACCC*, Final Report 15 April 2008

[61] Ovum, *Bitstream and Voice Services in a Next Generation Network A report to the ACCC*, Final Report 15 April 2008

[62] Ovum, *Bitstream and Voice Services in a Next Generation Network A report to the ACCC*, Final Report 15 April 2008

[63] EU Information Society website, *Reforming the current telecom rules*, <http://ec.europa.eu./information_society/policy/ecomm/tomorrow/index_en htm>

[64] Namely the rights for users to distribute and access (lawful) content, to run applications, and to connect devices of their own choice.

[65] Ovum, *FTTx Regulatory Triannual Monitoring Reports: Report No.*3 (A report for the ACCC), March 2008, p.13

The French Regulator ARCEP (in July 2007) launched two consultations on optical fibre networks which highlighted two key areas of concern:

- access to ducts with a view to rolling out high speed broadband local loops and
- sharing the terminating segments of FTTH specific bottlenecks.[66]

In October 2008 the ARCEP released recommendations on FTTH last mile deployments. The ARCEP found that fibre roll out to existing buildings must allow for third parties to provide broadband services to the building residents in a non – discriminatory way.[67] ARCEP stated that the obligation to share access to the network encompasses:

- the supply of connections, which may require the intervention of the building operator (e.g. landing connection, risers)
- the location of the shared access point(s) and, more generally, the building operator's methods for connecting to the network, including, if applicable, related services such as hosting at the shared access point, cable connection and abutment
- the type of sharing of the last part (e.g. optical cable splicing, passive access with cross-connection, activated offer, multi-fibre)
- the provision of prior information enabling third-party operators to identify eligible buildings and dwelling units, and to connect to the building operator's network within a non-discriminatory time frame.[68]

France Telecom has agreed to ARCEP's request to make fibre optic infrastructure such as ducts available to competitors. The incumbent also accepted ARCEP's recommendation that only one fibre network should be installed in a building and that the operator that is selected to install the building network should lease the building fibre to other operators on a non-discriminatory basis.[69]

Irish telecoms regulator Com Reg has announced it plans to expand the LLU definition to include all forms of local access technology, including fibre, rather than just DSL. If this

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[66] Ovum, *FTTx Regulatory Triannual Monitoring Reports: Report No.*3 (A report for the ACCC), March 2008, p.37

[67] ARCEP *Recommendations on the implementation of last drop sharing of the last part of Optical Fibre Networks*, October 2008 viewed at < http://www.arcep fr/uploads/tx_gspublication/recomd-mutual-ftth-1008-eng.pdf>

[68] ARCEP *Recommendations on the implementation of last drop sharing of the last part of Optical Fibre Networks*, October 2008 viewed at < http://www.arcep fr/uploads/tx_gspublication/recomd-mutual-ftth-1008-eng.pdf>

[69] Lightwave Europe, *France Telecom plans massive FTTH roll out in 2009*, article written 2008, < http://lw.pennnet.com/display_article/321309/63/ARTCL/none/none/1/France-Telecom-plans-massive-FTTH-roll-out-in-2009/>

decision is put into effect, Ireland would join Japan and Korea in regulating fibre access.[70] The South Korean LUU directive includes bitstream access.

Different countries have proposed slightly different ways of obtaining access to the bitstream. By way of example the Spanish regulator (CMT) has ruled that Telefonica must provide wholesale bitstream access for speeds up to 30Mbps (higher speeds will not be regulated) across the entire country, regardless of the infrastructure or technology supporting the service, all at cost-based prices.[71] The EC expressed concern over the exclusion of bandwidth above 30mbps from the market definition. The concern is that deregulating speeds over 30mbps may make if difficult for alternative operators to compete with Telefonica in the rollout of services that require high bandwidth such as IPTV. This example of regulation at particular speeds, may be instructive for Australian regulators considering firstly, whether to regulate a bitstream and secondly, what if any, speed requirements should be placed on such access.

The NTT in Japan has mandated open access. The network is designed to allow competitors in, including sizing cabinets to provide access and providing access at multiple layers, including at the passive optical network (PON) splitters. [72] The unbundling of the fibre does not give dedicated fibre to individual customers but rather to a group of customers either 8 or 32 customers.

In the US, no open-access requirements exist for broadband networks (FTTH and FTTN).[73] As part of the US Stimulus package of $7.2 billion to deploy FTTH, the FCC been given one year to develop a comprehensive broadband plan to provide universal coverage and encourage use of the network. Grant recipients must also adhere to non discrimination and network interconnection obligations.

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[70] Commission for Communications Regulation, *Consultation - Market Analysis: Wholesale Unbundled Access* , 18 June 2008, accessed on the ComReg website at: <http://www.comreg.ie/publications/consultation_-_market_analysis__wholesale_unbundled_access.597.103109.p.html >

[71] Ovum Knowledge centre – Ovum Opinion Marcela Perez Sirio, *CMT regulates bitstream, but EC concerns remain,* 13 February 2009, <http://www.ovumkc.com/kc/telecoms/news>

[72] Carol Wilson Telephony Online, *Regulation may hinder FTTH* http://telephonyonline.com/residential_services/news/ftth-regulatory-challenges-0113/ viewed February 2009

[73] Carol Wilson Telephony Online, *Regulation may hinder FTTH* http://telephonyonline.com/residential_services/news/ftth-regulatory-challenges-0113/ viewed February 2009

Attachment 2– International Summary Tables 1-3

COUNTRY	Type of fibre roll-out	Coverage	Government intervention	Carriers deploying FTTH/B
Germany	**Wilhelm Tel** and **M-Net** deploying FTTB/H (the FTTH and FTTB figures located are not separated out)	**Wilhelm Tel** has passed FTTH/B to 100,000 premises. **M-Net** has passed FTTH/B to 80,000 premises.	Municipal level	**Wilhelm Tel** and **M-Net**
Holland	Amsterdam local council's **CityNet** is deploying FTTH.	**CityNet** project is expected to provide fibre to over 420,000 homes and businesses by 2013. First phase of project will cover 40,000 premises is on track to be completed in 2008. **Reggefiber in a joint venture with KPN** is also rolling out FTTH in 5 Dutch cities. KPN does not yet have the intention to roll out FTTH on a large scale.	Extensive at municipal level.	**CityNet** **Reggefiber**
Italy	**Fastweb** – FTTH	**Fastweb's** FTTH build is mainly centred around Milan.	Municipal level	**Fastweb**
Sweden	The largest national fibre provider in Sweden is **B2**, a subsidiary of the Norwegian incumbent Telenor. The Swedish incumbent, TeliaSonera, released plans in March 2008 to begin deploying a mixture of fibre and copper for a NGN.	According to WIK Consulting, **B2** fibre is available in more than 100 cities. Sweden is Europe's largest FTTH market, with more than 500,000 of its 4.5 million homes already connected to a high-speed fibre pipe	Extensive at municipal level. Since June 2005, all municipalities have had access to at least one local fibre network and two-thirds of all municipalities have had access to two or more.	**B2** (alternative operator)
France	**France Telecom** is deploying FTTH **Iliad (Free)** and **Neuf Cegetel** – FTTP **Numericable** – FTTH	**France Telecom** expects to reach 4 per cent of its targeted 1 million homes by 2009. France Telecom has installed pilot GPON FTTH networks in Paris, the Hauts de Seine département, Lille, Lyon, Marseille, Poitier, and Toulouse. **Iliad (Free)** and **Neuf Cegetel** have announced FTTP deployments to 4 million and 1 million homes respectively. **Numericable** announced that it had passed 1 million homes and expected to reach 2 million by 2007.	Municipal level	**France Telecom** (incumbent) and a number of smaller alternative operators

Overview of FTTH developments internationally – Development in major European markets

Developments in Japan, South Korea and Singapore

COUNTRY	Type of fibre roll-out	Coverage	Government intervention	Type of carrier / operator
South Korea	**KT Corp.** is deploying FTTH. **Hanaro Telecom (HT)** is deploying FTTP and FTTH.	**KT** is aiming for 100 per cent coverage of FTTH by 2010. It currently has 2.3 million fibre subscribers. **HT** currently has 1.1 million fibre subscribers.	High level of national government intervention.	**KT Corp** (incumbent) **Hanaro Telecom** (main rival operator) There are also a number of other smaller operators.
Japan	**NTT** – FTTH **Softbank** – FTTH **TEPCO** (power company) – now wholesales its 100 mbps symmetric broadband open-access fibre to 16 ISPs.	**NTT** is targeting 30 million connections by 2010. **TEPCO** is on target to exceed one million subscribers by 2008.	High level of national government intervention	Incumbent **(NTT)** and a number of new entrant operators, as well as power companies in the big cities. In total, **nine** operators are building FTTH infrastructure.
Singapore	**Netco / OpCo** – FTTH	The Next Gen NBN is expected to be available nationwide by 2015, although consumers can begin to look forward to a range of new and exciting Next Gen Services such as high-definition video conferencing, telemedicine, Grid Computing-on-Demand, security and immersive learning applications on the Next Gen NBN from about 2010[74].	Under the terms of the Next Gen NBN NetCo RFP, the Government is prepared to provide a grant of up to S$750 million for the project.	Not know yet. See above analysis for information on consortium bidders.

[74] From the IDA—Singapore regulator—website. http://www.ida.gov.sg/News%20and%20Events/20071211184512.aspx?getPagetype=20

Developments in other countries

COUNTRY	Type of fibre roll-out	Coverage	Government intervention	Type of carrier / operator
United States	**Verizon** – FTTH **AT&T** – FTTP	In its policy blog, **Verizon** claims that, at the end-2007, it has passed 9.3 million homes and businesses with via FTTH, which is over 50 per cent of is targeted 18 million homes by 2010. **AT&T** plans to deploy to around 18 million homes by the end of 2008 and FTTH to 1 million subscribers by the end of 2007. **AT&T** is installing gigabit passive optical network (GPON) in these greenfield FTTH deployments. The deployment could reach several hundred thousand new customers per year from 2009 onwards. Verizon announced in June 2008 that is was dramatically increasing its fibre-based FIOS service speeds across all its tiered offering. Verizon will now top out at 50 Mbps downstream and 20 Mbps upstream up from 30/15 Mbps. Existing customers can request faster speeds, which are available in some cases at no extra cost.[75]	Relatively low. Markets are mainly characterised by government / regulators letting cable operators and telcos battle it out.	**Verizon** (incumbent) and rival operators such as **AT&T** – which is the largest telco in the US.
UK	**BT** – limited FTTH greenfields no national roll out	In the UK, The Broadband Stakeholder Group has predicted that providing a UK-wide FTTH network in the UK would cost £15bn. "There are currently no plans for any large scale FTTH deployments in the UK and BT has said it will only use the technology on new housing estates."[76]	low	**BT** is the incumbent telco in UK. BT is subject to an operational separation regime.

Sources for tables 1 - 3: Mainly drawn from Ofcom's *Future Broadband Policy approach to NGA* and Ovum's third *Triannual FTTx report.*

[75] PC World, *Competition Emerges for Fastest Broadband* accessed on PC World website at: http://www.pcworld.com (19/06/08)

[76] BBC news online, dated 29 December 2008 viewed February 2009

Attachment 3 – FTTH Retail prices

Provider	Service	Max Speed	Download	Price	Excess usage
Telstra	Fibre home phone			Standard HomeLine rates	
	FTTH 'Velocity'	20000/512 kbps	600MB	$79.95	15c/MB
		20000/512 kbps	12GB	$109.95	Shaped
		20000/1000 kbps	25GB	$139.95	15c/MB
		20000/1000 kbps	60GB	$169.95	15c/MB
TransAct	Fibre home phone			$27.95	
	FTTH broadband	10000/10000 kbps	500MB	$39	10c/MB
		10000/10000 kbps	60GB	$118	10c/MB
		30000/30000 kbps	500MB	$107	10c/MB
		30000/30000 kbps	10GB	$127	10c/MB
		30000/30000 kbps	60GB	$182	10c/MB

Provider	Service	Max Speed	Download	Price	Excess usage
Pivit	Fibre home phone			$25	
	FTTH 'FiBand'	10000/10000 kbps	200MB	$30	15c/MB
		10000/10000 kbps	12GB	$70	Shaped
		10000/10000 kbps	20GB	$100	Shaped
		10000/10000 kbps	50GB	$170	Shaped
Arise	Fibre home phone			$24.95 or $29.95	Shaped
	FTTH broadband	1000/1000 kbps	500MB	$19.95	Shaped
		2000/2000 kbps	5GB	$49.95	Shaped
		10000/10000 kbps	10GB	$69.95	Shaped
		10000/10000 kbps	40GB	$139.95	Shaped
Cirrus[77]	Fibre home phone			$15	Shaped

[77] This is provided over an Opticomm network at the Fernbrook estate

Provider	Service	Max Speed	Download	Price	Excess usage
	FTTH broadband	5000/5000 kbps	5GB	$40	Shaped
		5000/5000 kbps	10GB	$44.95	Shaped
		5000/5000 kbps	20GB	$69.95	Shaped
		5000/5000 kbps	60GB	$109.95	Shaped
Internode	Fibre home phone			$25	
	FTTH broadband (Home Fibre 25)	1000/25 000kbps	5GB	$49.95	Shaped
		1000/25 000kbps	25GB	$69.95	Shaped
	(Home Fibre 50)	2000/50 000kbps	10GB	$79.95	Shaped
	FTTH broadband (Home Fibre 50)	2000/50 000kbps	50GB	$119.95	Shaped
	FTTH broadband (Home Fibre 100)	5000/100 000kbps	15GB	$99.95	Shaped
		5000/100 000kbps	60GB	$144.95	Shaped

Source: Retail prices for Telstra, TransACT and Pivit are derived from their respective websites. Retail prices for Arise and Cirrus derived from information provided by their respective sales departments (January 2009)

Attachment 4 – Costs of FTTP and FTTN – Confidential table

INDICATOR	DCITA (2006) (FTTN)	ANALYSYS (FTTN) 2006	Ovum (FTTN) 2007	ANALYSYS (FTTP) 2006	Ovum (FTTP) 2007
Premises covered	•**3,117,966** [c-i-c]	•**5.6M** [c-i-c] 1.5M businesses [c-i-c] 4.1M residential [c-i-c]	•**4.5M** [c-i-c]	•**5.6M** [c-i-c]	•**4.5M** [c-i-c]
Coverage	FTTN to the 5 major cities excluding distribution areas that are 95% serviceable from the exchanges [c-i-c].	five major cities of Australia (focusing mainly on ULLS Bands 1 and 2) [c-i-c]	60% of ULLS Band 2 households. Checked against the GNAF, 60% of band 2 is ~ 4.5m [c-i-c]		60% of ULL Band 2 households. [c-i-c] Checked against the GNAF, 60% of band 2 is around 4.5m [c-i-c]
Nodes	•**20,657** [c-i-c]	•**20,723 upgraded** [c-i-c] •**17,734 full FTTN build** (fibre link) [c-i-c]	•**23,437** [c-i-c]	**N/A**	**N/A**

INDICATOR	DCITA (2006) (FTTN)	ANALYSYS (FTTN) 2006	Ovum (FTTN) 2007	ANALYSYS (FTTP) 2006	Ovum (FTTP) 2007
Node-related costs	**45 % [c-i-c]**	**52%** of overall FTTN cost composition. However, Analysis places line cards in a category of its own. If line cards are considered 'node-related', then the total node-related costs would constitute **76 per cent.** **[c-i-c]**	**Not sure**	**N/A**	**N/A**
Build over # of years	**Not sure**	**Not sure**	**4 [c-i-c]**		**5[c-i-c]**
Access technology	**ADSL**	**ADSL**			
Total cost	**$1.28B[c-i-c]**	**$2.5B[c-i-c]**	**$1.4B[c-i-c]**	**$14B[c-i-c]**	**Between $2.2 and $4 billion.** **[c-i-c]** *The lower estimate rests on an assumption of significant reductions in the cost of deploying fibre as work crews became more experienced.
Cost per premises	**$412 [c-i-c]**	**$444 [c-i-c]**	**$311[c-i-c]**	**$2,500[c-i-c]**	From the lower cost estimate **$489 [c-i-c]** From the higher cost estimate - **$889** **[c-i-c]**