The Telecom logo is a white box containing the word "Telecom" in white text. To the right of the text is a square divided into four colored quadrants: yellow (top-left), green (top-right), blue (bottom-left), and red (bottom-right). The background of the slide features a network diagram with white lines connecting various nodes, some of which are colored circles in orange, red, blue, yellow, and green.

Telecom

A National Fibre Solution for New Zealand

SUBMISSION IN RESPONSE TO THE GOVERNMENT'S BROADBAND INVESTMENT INITIATIVE

27 April 2009

Hon Steven Joyce
Minister for Communications and Technology
Parliament Buildings
Wellington

Dear Minister

The Government has shown a bold vision for New Zealand's broadband future which we support and share.

The \$1.5 billion investment will create an enduring asset capable of delivering benefits to current and future generations of New Zealanders.

You have asked for innovative and creative options for how New Zealand can make best use of the Government's investment, and we offer two such alternative solutions. We present them as constructive additions to the list of options for the Government to consider.

The alternative options are '*accelerating the roll-out of fibre infrastructure by co-ordinating both our investments*' and '*creating a national fibre ducting asset*'.

I believe these options give the Government, on behalf of the people of New Zealand, the most return for its investment. They ensure we, as a nation, get additional infrastructure for the Government's money. Both proposals ensure Telecom's wholesale and retail services will not be advantaged over other service providers. They leave the investment decisions, and returns, clearly with the Government.



The two options:

- Provide the fastest possible return to New Zealand...with one option providing fibre to every North and South Island hospital within 2 ½ years and every school within three years of agreeing to proceed.
- Provide a national solution, that focuses on the services people receive, not just the infrastructure or technology.
- Leverage New Zealand's (not just Telecom's) investment in telecommunications to the maximum possible extent.

Telecom has been a part of New Zealand's telecommunications evolution for over 140 years. The Government's aspiration for fibre to the premises is an opportunity for New Zealand to position itself as an international leader in this area. It's a challenge that Telecom's people, management team and Board welcome, because we recognise the benefits that fibre can bring to customers.

We propose extending our strong partnership models with Government to this new environment.

I am proud of what Telecom has delivered and has committed to delivering in the future. We welcome the opportunity to extending those commitments to include working with your government on realising your stated vision.

Yours sincerely

A handwritten signature in blue ink that reads "Paul Reynolds". The signature is fluid and cursive.

Paul Reynolds
Chief Executive Telecom New Zealand



A bold vision

The Government has shown a bold vision for New Zealand's broadband future which we support and share.

A \$1.5 billion investment in accelerating deployment of a fibre to the premise (FTTP) network over the next ten years is a significant step towards increasing New Zealand's international competitiveness. It will create an enduring asset capable of delivering benefits to current and future generations of New Zealanders.

Ultra-fast broadband is a key enabler of a stronger economy through increases in productivity, higher educational attainment, and better health care. The initial focus on business, health and particularly the education sectors provides a strong platform the rest of the country can leverage.

The Government's Consultation Document provides clear guidance on its priorities and the principles underpinning the Government's policy. It sets an exciting goal for the industry to aim at.

Taking fibre further

The Minister has asked for innovative and creative options on how New Zealand can make best use of the Government's \$1.5 billion to achieve the Government's vision. We have accepted this challenge, and offer two alternative solutions. These both build on the work done by the Government in its Consultation Document. We present them as constructive additions to the list of options for the Government to consider, together with those from other submitters. The alternative options are:

- *Accelerating the roll-out of fibre infrastructure by co-ordinating the Government's investments with our own.* This option provides the maximum leverage of New Zealand's existing fibre investments and the most new fibre for the Government's money. We will ensure the benefits of the incremental Government investment accrue only to the Government.
- *Creating a national fibre ducting asset,* which all network and Service Providers could use to deploy fibre into homes. This asset is a fibre ducting network that builds on New Zealand's ducting assets, whoever owns them.

These options:

- Lay the foundation for fibre to the premises to 75% of New Zealanders, and beyond. The 75% coverage area we propose differs from the Consultation Document and includes Waiheke Island and key additional regional centres such as Queenstown, Greymouth, Rangiora and Gore.
- Deliver ultra-fast broadband to every North and South Island school and hospital. The accelerated fibre option provides fibre to every hospital in 2 ½ years, and every school within 3 years of agreeing to proceed.
- Provide an incredible platform for future rural broadband acceleration.
- Accelerate connections to businesses, schools, health centres and new residential "greenfield" developments first. Then connect other important focal points for local communities such as Marae and libraries.
- Ensure all communities within the 75% coverage area receive a consistent level of service, and ensure regional disparities do not emerge within this coverage area. This can only come from a national service focussed solution.
- Provide the Crown with absolute discretion over how the Government's investment is directed.
- Deliver open access, equivalent services to all Service Providers across all Government funded infrastructure. Telecom's retail and wholesale business units will not be advantaged over other Service Providers.

Telecom has been a part of New Zealand's telecommunications evolution for more than 140 years. From the very beginnings of New Zealand's telecommunications links, our people have been combining the best of Kiwi ingenuity with the rapid advances in telecommunications technology to deliver the best possible communications infrastructure for New Zealanders.

Fifty-three years ago that technology was the advent of the first automated telephone exchange in Masterton. In 1999, we were among the first telecommunications carriers in the world to launch commercial broadband services.



We know how important these links to the world are.

The Government's aspiration for fibre to the premises is an opportunity for New Zealand to position itself as an international leader in this area. It's a challenge that Telecom's people, management team and Board welcomes, because we recognise the benefits that fibre can bring to customers.

Our passion for technology, and the benefits that it brings to New Zealand is evidenced today by the significant investment - over \$1.3 billion - we are making this year alone in our fixed and mobile networks, our services and our systems. Our four-year fibre to the node (FTTN) programme provides an enhanced broadband experience to 84% of New Zealanders. Our entirely new 3G mobile network is 'faster in more places' and will support a range of innovative new mobile offerings. This includes potentially extending broadband beyond where fibre and fixed line technologies can.

We understand investments are about more than technology - they are about delivering real and dramatic improvements to our customers. In just 18 months for example, our broadband service performance has gone from lagging the UK's, to exceeding it by 27% according to the latest report for the Commerce Commission.

Our capacity to commit to the levels of investment we have been delivering to date, and to access this level of funding from the capital markets, is unrivalled in New Zealand. With the right commercial conditions we can, and will, continue to invest significantly in New Zealand assets that will deliver benefits for New Zealanders.

The options we have outlined:

- Provide the fastest possible return to New Zealand. The accelerated fibre option has every North and South Island hospital connected to fibre in just 2½ years of agreeing to proceed, and school connected in just 3 years. It also provides a platform to accelerate rural broadband performance.
- Provide a national solution, which focuses on the services people receive, not just the technology.
- Leverage New Zealand's (not just Telecom's) investment in telecommunications to the maximum possible extent. We will work with the Crown to ensure the Government's investment does not simply replicate what we as a nation have already got.

As a proud New Zealand company employing over 7,000 Kiwis directly, and a further 5,000 indirectly, we want New Zealanders, and New Zealand businesses to succeed on the world stage. These Kiwis and Kiwi enterprises are our customers, and we want to be a key enabler of their success.

We are a proven performer and an enormous investor in New Zealand infrastructure and the services that run over that it. We look forward to continuing our close working relationship with the Government and the wider Telecommunications industry as the country now focuses on increasing fibre investments.



Commentary on the Government's Consultation Document

Telecom supports the Government's objective, and the principles underpinning it. We agree Government investment is necessary to accelerate deployment of fibre to the premises infrastructure.

The Government's objective will see New Zealand among the first group of countries to achieve widespread deployment of fibre to the premises – an international leader alongside the likes of Japan, South Korea, Singapore and Australia.

Fibre to the premise is a critical competitive enabler as we take New Zealand's history of innovation and creativity into a globally connected future. We know fibre based speeds bring New Zealand businesses nearer to large international markets. This initiative extends this benefit to all New Zealand businesses.

As the Consultation Document notes, the continuing evolution of the internet, and the associated rapid growth in the bandwidth needs of businesses and homes, points to fibre to the premises. This is because of the increased capability and capacity it can deliver, and we will need. Countries that invest in this capability early will be well positioned to make best use of those applications and services when they arrive. Large-scale deployment of fibre to the premises is known to come with an inherent economic challenge. New Zealand has positioned itself as an international leader in fibre to the premises through this initiative, and it is investing in that infrastructure before there is a stand-alone business case. The uncertainty surrounding customer demand for fibre based services and the unwillingness of customers to pay a market rate to cover the substantial investment required means telecommunications Network Operators around the world have been hesitant to commit to nationwide deployment of wholly fibre networks.

Telecom and other companies in New Zealand have deployed extensive fibre to business organisations and to some suburban greenfield developments, based on the existing business case for doing so.

Government investment is appropriate and sensible to capture the public and economic benefits of accelerating investment ahead of demand and ahead of other countries.

We also agree with the principles set out in the Government's Consultation Document for how it should invest in this area. We comment further on the principles and key points of the proposals as follows:

- *Businesses, schools, health centres and greenfield developments are the first priorities.* These sectors of the economy realise immediate economic and social benefits from fibre to the premises. For this reason we have deployed significant fibre in each of these sectors. We add selected Marae and community centres to this list as these facilitate early and easy access to ultra-fast broadband at a community level.
- *Extending fibre to the premises capability to the first tranche of residential homes is the next priority.* Replacing the existing copper cables with fibre optic cables on a home by home basis is much more capital intensive than targeted deployment of fibre to specific sectors, and will take longer. Telecom is in the early stages of investigating the economics of this type of activity. In July this year, Chorus will invest \$1 million in a micro-ducting deployment to about 1,100 existing homes in Manurewa. This is part of an 'undergrounding programme' for overhead power and telephone lines in the area, and will support fibre to the premises.



- *Avoiding excessive duplication of existing infrastructure is critical* if New Zealand is to achieve the lowest cost fibre network. Fibre to the premises on the scale envisaged by the Consultation Document requires significant capital expenditure – Dr Milner’s paper on the costs of fibre to the premises, prepared for the Treasury in February this year, estimates the costs at between \$3.5 billion and \$7.5 billion in total. The illustration below shows how this end-to-end cost is made up. Finding a business model that meets the Government’s policy objectives for the country and incents the private sector to contribute is challenging. Making the most of as much of the country’s existing infrastructure assets as possible, by directing Government investment at building new assets for the nation, will be critical to a successful roll-out.

ESTIMATED COST TO CONNECT 75% OF PREMISES TO FIBRE NETWORK



- *Government investment in fibre to the premise infrastructure should not simply “line the pockets” of any private partner, or preserve legacy assets of the past.* Private investors will require adequate return to participate in the Government’s programme. The Government will want to be assured that the returns to private partners are not unreasonable, and that the costs are minimised. There will be a number of ways in which the Government can achieve such assurance, of which regional tendering is one. In our proposal, we set out a viable model for ensuring cooperation between the Government and Chorus which would protect taxpayer interests. We absolutely support the proposal in the Consultation Document that the Government must be able to achieve a return from its investment if that investment proves commercially successful. Wherever possible we encourage using existing assets to get the most return, without protecting legacy technologies that do not meet the requirements customers have for speed.
- *Provision of open access dark fibre can be a core requirement of any Government investment in fibre infrastructure.* Where the Government invests in fibre infrastructure, it is appropriate that the Government decides the core requirement for how access to that infrastructure is provided.
- *Establishment of a Crown-owned investment company to manage the Government’s investment is sensible and necessary.*



Chorus
A Telecom New Zealand Business

Source:
Fibre-to-the-Premise Cost Study
prepared for Treasury
by Murray Milner 2009

Note: The range in network and equipment costs reflects varying levels of customer demand. Estimate also reflects deployment to two sides of street. A combination of aerial and underground fibre, no use of existing ducts/PODs, and lower cost CDM technology.



Partnering with Chorus

We want to partner with the Government to build a next generation fibre network that provides current and future generations of New Zealanders with a platform for success. We believe Chorus is best placed to partner with the Government to deliver next generation fibre infrastructure to New Zealanders.

If New Zealand is to make the absolute most of the Government's \$1.5 billion investment, the involvement of Chorus, Telecom's operationally-separated access network unit, will be crucial. Chorus has an extensive existing network and the experience designing, operating and managing telecommunications infrastructure that is without comparison in New Zealand. Its track record, industry relationships, credibility, supplier partners and people are without equal in the telecommunications field. No other potential partner can contribute more skill and experience to the Government and to New Zealand as a partner, or help achieve the Government's objective as fast and as reliably.

The best way for New Zealand to get the most value out of the Government's \$1.5 billion investment is to utilise and leverage Telecom's existing infrastructure assets. This ensures all the \$1.5 billion adds to the New Zealand economy, and is not wasted overbuilding something that we already have. Telecom already has over 23,500km of fibre optic cable installed across New Zealand (see illustration opposite), 637 telephone exchanges, 11,000 cabinets, 300,000 poles and a significant duct network. Chorus will use all these existing assets to lower the total cost, and accelerate the timeframes of a Government supported fibre to the premises deployment. Effectively this gives two bangs for the Government buck. There is no overbuild, and therefore wasted investment, and the Government leverages existing solutions, reducing complexity and cost.

Chorus is New Zealand's leading telecommunications utility. Building, designing and operating reliable and secure passive telecommunications networks is what it does. It has no other distractions or focus. Chorus will be the vehicle for any Telecom involvement in the Government's Broadband Investment Initiative.

Chorus is based on the vision of a telecommunications industry that works collaboratively to build a world-class network for New Zealand.



Operationally separated from the rest of Telecom into a stand-alone unit, Chorus has forged a reputation for leading collaboration in the industry and for building strong, enduring relationships with partners and customers. It built and delivered its local loop unbundling services faster than any other incumbent carrier we are aware of in the world. It is comfortably meeting its customers' unbundling timeframes to deploy their equipment in Exchanges and Cabinets premises. It is in the midst of delivering a four-year broadband network upgrade programme, delivering every milestone ahead of time.

As a stand-alone business unit, operating at arm's-length from the rest of Telecom, Chorus meets the requirement for the Government's partner to be active only at the wholesale level, and without a retail business.

Chorus is already working to evaluate every possible option for achieving the fastest and most cost-effective deployment of a widespread fibre to the premise network. On 17th April, Chorus issued a request for information from councils, utilities and Network Operators around New Zealand to identify opportunities to utilise existing network infrastructure which could assist fibre deployment and potential partnering arrangements. The request for information is available on the Chorus website, at www.chorus.co.nz/industry-reports. The information gathered will help ensure Chorus provide a comprehensive proposal when the Government's Crown Fibre Investment Company issues its RFP.

Chorus is also working with four multi-national service companies to secure access to a suitably skilled workforce to meet the demand to accelerate the build of fixed access fibre over the next decade.

Working together with its service company partners, 2,500 people in 1,700 Chorus vehicles visit homes and businesses all over New Zealand to install, maintain or repair telecommunications services. Chorus operates and maintains a network of over 130,000kms of copper and over 23,500kms of fibre today, with 637 telephone exchanges, 11,000 cabinets and 300,000 poles used for overhead cable.

Chorus has deployed fibre to the premise to over 2,000 homes in new housing developments with another 2,000 under construction, as shown in the illustration below. It is already in discussions to connect a further 4,000.

FIBRE DEPLOYMENT TO RESIDENTIAL LOTS



In June 2008, Telecom Wholesale customer WorldxChange Communications began delivering phone and broadband services over an open access fibre to the premises connection laid by Chorus. Telecom Wholesale is trialling two variants of broadband over fibre which will provide either a voice-only service or broadband and voice. We will use the lessons learnt from the broadband-over-fibre pilot to design and deploy a fully equivalent, fibre-based broadband service that will be available to all Service Providers.



Operational Separation of Chorus

New Zealand, and Telecom, has the world's most extensive operational separation model. This means that Telecom's retail businesses are truly separated from the provision of network/wholesale services.

Operational separation is based on the principles of equivalence, transparency and equal access to information, and those are principles we are strongly committed to. The model is established and proven. It provides New Zealand with a separation model on which to build a national fibre network, with some amendments to allow for the role of the Crown in directing and monitoring Chorus' use of Government funding.

Some commentators have suggested that the Government's fibre to the premise vision could be most efficiently delivered through a public-private partnership with Chorus. We believe our track-record over the last 18 months demonstrates the existing Operational Separation model for Chorus, in which the Government and Telecom have invested very heavily, offers the speediest and most effective foundation for delivery. However, we remain open to considering alternative partnership models that can be demonstrated to deliver the desired outcomes for New Zealand and that respect Telecom's shareholders' interests.



Finding a New Zealand solution to take fibre further

The Consultation Document asks for creative thinking about how New Zealand can best achieve the Government’s vision, consistent with the principles it has set out.

We have identified two options, each of which builds upon the work done by the Government in its Consultation Document. These are described in more detail in the following pages. Both share the following common elements:

1. Prioritising the Government’s goals - connecting businesses, health, and education sites first, as well as selected community sites – including the option of extending that connectivity programme to every school and hospital in New Zealand.
2. Providing for the Government to determine how much of its investment is directed at the fibre ducting, the ‘feeder’ fibre that gets deployed through streets and past homes and the final customer connection to that network. Under any scenario, \$1.5 billion will not be sufficient to deliver a customer connected fibre network to 75% of New Zealanders. Therefore, trade-offs are inevitable between the coverage and extent of the network, and funding customer connections.

The more the Government directs its investment at ducting, the more homes could connect to the fibre. The more it invests in the end to end solution, the fewer homes can access the funding.
3. Proposing a national solution. This enables a more simplified operating and governance structure that reduces complexity for all parties. It provides a single shop front for Service Providers with standardised technology and interfaces. Ultimately, a national solution provides the Crown with better transparency of the progress being made towards the end goal. A co-ordinated national approach is critical to New Zealand achieving a solution which:
 - Makes the smartest use of public funding by achieving the largest scale and scope economies as possible.
 - Provides a standardised national network across the coverage area, which reduces the potential for regional disparities to emerge.
 - More readily adapts to shifting industry standards and technologies, and better meets the requirements of retail services providers and their customers.

4. Providing for deployment of infrastructure for residential fibre to the premises capability, covering up to 75% of New Zealand within a ten year timeframe. Covering a wider cross-section of New Zealand than in the Consultation Document, our proposal includes the higher density areas of all of the following cities and towns:

Ashburton	Auckland	Beachlands	Blenheim
Brighton	Cambridge	Christchurch	Diamond Harbour
Dunedin	Feilding	Gisborne	Gore
Governors Bay	Greymouth	Hamilton	Hastings
Hawera	Hibiscus Coast	Invercargill	Kaipoi
Kumeu	Levin	Lyttelton	Masterton
Napier	Nelson	New Plymouth	Oamaru
Paekakariki	Palmerston North	Paraparaumu	Prebbleton
Pukekohe	Pukerua Bay	Queenstown	Rangiora
Raumati	Red Beach	Richmond	Rotorua
Runciman	Taupo	Tauranga	Te Awamutu
Templeton	Timaru	Tokoroa	Waiheke
Waikanae	Wanganui	Wellington	Whakatane
Whangarei			

The calculation of this 75% of New Zealand is based on extensive modelling undertaken as part of our FTTN broadband network upgrade and includes a number of areas not in the Consultation Document. By more tightly defining the coverage zone around the central areas of each city or town, we can cover a larger number of locations, and achieve a material reduction in deployment costs.



5. Proposing the dark fibre network is built in a technology neutral way, capable of supporting either Passive Optical Networking (PON) or Active Ethernet Fibre (AEF, or point to point) fibre architectures, rather than choosing now between the two. We suggest building a network primarily designed for PON but ensuring that any fibre aggregation nodes containing splitters could be used to migrate to point to point by splicing distribution fibre to feeder fibres.

This national approach doesn't rule Telecom out of a regionally focused tender process as proposed in the Consultation Document. If a regional approach remains the Government's preferred option, we will tender for those regions where it is commercially viable to do so.

Implications for rural New Zealand

Each of these proposals is capable of extending faster broadband to the remaining 25% of New Zealand; Option 1 provides a platform for meaningful improvements in rural broadband network performance, as well as in the 75% coverage area.

Rural New Zealand is most likely to be served by a range of technologies, which will include fibre, mobile and wireless technologies and satellite. The potential for New Zealand to release significant new spectrum in the near-term through consolidation within the UHF band is one of the many opportunities we have identified for addressing broadband needs in these parts of the country.

We look forward to participating in the Government's rural broadband consultation, where these issues will be more properly canvassed.



Option 1: Accelerated fibre roll-out

CFIC-Chorus collaboration	
<p>100% of schools and hospitals in the North and South Islands</p> <p>2,000 schools & all hospitals within 2½ years of agreeing to proceed</p> <p>Remaining schools in the next 6 months</p>	<p>A truly national solution providing a platform for improving broadband performance in urban and rural New Zealand</p>
<p>Co-ordination of Government and Chorus investment.</p> <p>All Government investment is in new assets for New Zealand</p>	<p>Open access infrastructure</p> <p>Dark Fibre service on all Government-subsidised fibre</p>

Structure

Telecom deploys fibre to many New Zealand businesses and an increasing number of homes. Under this option, the Crown funds an acceleration of this national FTTP network deployment.

The Crown Fibre Investment Company (CFIC) contracts directly with Chorus to invest in infrastructure for FTTP, in accordance with the principles set out in the Consultation Document.

The Crown (via the CFIC) sets investment criteria and directs the network deployment towards its fibre objectives, such as the speed of the roll-out and prioritisation of users and locations. An audit process set by CFIC tracks delivery of those objectives and provides absolute transparency as to how the Government's investment is applied.

The Crown achieves a commercial return on its investment should that investment prove to be commercially successful.

Investment focus: new build, schools and hospitals

Government funds are directed at extending fibre into new areas, and coordinated with Chorus' already significant investment plans. No public funds are wasted on inefficient overbuild of existing fibre, or on the administrative costs inherent in setting up new industry organisations and structures.

This option enables New Zealand to make best use of Chorus' existing assets, technologies and experience. Chorus is well established within the industry, with a strong, transparent governance structure, within a regulatory environment that promotes competition and a level playing field. It has a proven business model the Government and New Zealanders can depend on to make the best use of public funds.

The first priority is the provision of ultra-fast broadband to health and education services. We will deliver an ultra-fast broadband solution to every hospital and school¹ within 2½ years of agreeing to proceed. This makes the vision of combining classrooms right across the country a reality. We are undertaking detailed bottom-up planning for this purpose. Our initial assessment is that, by leveraging off Telecom's existing assets and investment plans, we could deliver fibre to the premise to:

- 2,000 North and South Island schools and all hospitals (93) within 2½ years of agreeing to proceed; followed by
- The remaining 600 schools outside the 75% coverage zone, within a further six months.

The roll-out would extend to other medical facilities (we are examining the feasibility for example of addressing all medical practices and pharmacies), key community centres such as key Marae and libraries.

Deploying fibre to businesses is critically important to New Zealand achieving productivity increases from this deployment. This is a top priority under this proposal, and we have a strong base to start from. Business fibre connections are generally available on request within 30 working days from 600 fibre-fed Telecom and Chorus exchanges² today, and Telecom today provides FTTP connections to 5,000 business premises throughout New Zealand (see Illustration on next page).

¹ For list of schools refer: <http://www.telecom.co.nz/content/0,8748,200653-1548,00.html?nv=tpd>

² For list of exchanges refer: <http://www.chorus.co.nz/fibre>





Infrastructure for FTTP to 75% of homes, and improved broadband network for the other 25%

Addressing the first 75%

The CFIC decides the best way to spend the remainder of the Government's \$1.5 billion dollars to deploy FTTP infrastructure, to residential homes, and how this investment is best co-ordinated with Chorus existing and future investment plans.

Chorus' existing long-term capital plans see it spending in the order of \$1.5 billion on its local access network over the next ten years. Under this option, the CFIC ensures the Government investment adds to, rather than overbuilds existing or planned investments.

Telecom's policy is to deploy fibre to the premises today in all new residential "greenfield" developments of 50 lots or more. Under this option, we extend that policy to deploy fibre to all greenfield developments in the 75% coverage zone, irrespective of size.

We encourage the CFIC to concentrate investment on a mixture of:

- Deploying local access fibre ducting and fibre feeder cable, to maximise the number of New Zealand homes passed by the fibre network.
- Subsidising, or deploying, the connection of fibre leads into the homes of New Zealanders who want to subscribe to fibre-based services.

In the course of connecting schools, hospitals and businesses, there is considerable scope to accelerate the shortening of existing copper loops. This allows an optimised VDSL2 deployment. This delivers significant broadband speed increases to those customers not willing to pay for fibre to the premises at much lower incremental costs.

Building a platform for the remaining 25% of New Zealand

Deploying FTTP to every school and hospital in New Zealand also begins to address key constraints on broadband network performance in the remaining 25% of New Zealand.

We will use this extended fibre base to increase mobile coverage and performance for all mobile carriers as well as improve and extend DSL broadband performance.



Case Study:

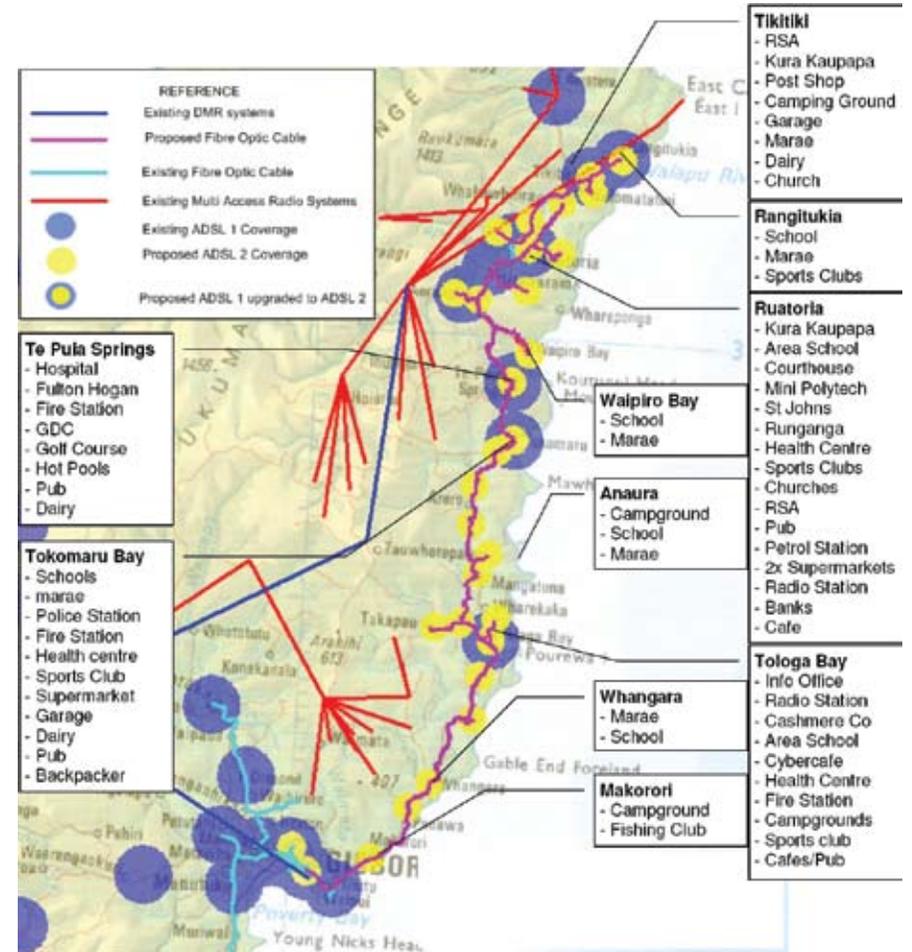
Chorus and Gisborne District Council investigated the potential broadband network improvements that could be delivered to the Gisborne-Ruatoria region if Government funding (\$10 million towards a total project cost of \$13 million) was provided. The 200km of fibre between Gisborne and Rangitukia also enabled broadband for 20 settlements along the route (see illustration opposite).

In order to deploy FTTP to the schools in this region under this proposal, Chorus and CFIC will deploy that same fibre backhaul to realise the same network improvements.

We will repeat this example around the country under this option. We already have similar case studies for many other regions in New Zealand.

Open access

All Services Providers will be offered access to the FTTP deployments funded by the Government as an open access dark fibre product at an agreed price. An open access co-location service enables Service Providers to unbundle fibres at specified interconnection points. Local loop unbundling and sub-loop unbundling would continue to be accessible from Chorus on an equivalent basis under the existing regulation.



Service Provider perspective

Service Providers will enter into commercial arrangements with Chorus to purchase an “Unbundled Fibre Service (UFS)” in the areas where the Government funded network is available. This is a very similar arrangement to the one that exists today for access to Chorus’ copper network (UCLL). Chorus will also provide a co-location service in the local exchanges that serve as fibre aggregation and interconnection nodes for the network (usually described as Central Offices). There are likely to be significantly fewer Central Offices for the new network that Service Providers would need to interconnect at than is the case with UCLL.

At the Central Office, Service Providers would locate their service electronics (Optical Line Terminators, if operating a PON network or Ethernet Switches, if operating an Ethernet point-to-point service).

For Service Providers that want to operate a PON network, Chorus will also provide optical splitters in the fibre aggregation nodes for the Service Provider to use to service its customers. Alternatively, Chorus could just provide co-location space in the distribution cabinets if Service Providers wished to provide their own. In this case, the UFS would need to consist of feeder fibre separately from distribution fibre (as one feeder fibre would service multiple customers).

The UFS service terminates at a demarcation point at the customer’s premises. The Service Provider is responsible for the installation of customer premise electronics (either Optical Network Terminator or Optical Ethernet Device). As is the case for the current UCLL service, Chorus will provide home installation and wiring services on a commercial basis.

Chorus or other third party backhaul providers will provide regional backhaul service to Service Providers in a similar way as is provided today for the UCLL service.



Option 2: Crown-owned Fibre Network Company

CFNC-Chorus network management agreement

A Crown Fibre Network Company that owns a national fibre ducting network. Management and build outsourced to Chorus

FTTP to schools, hospitals, businesses, based on **commercial arrangements** with other Network Operators.

Open access **fibre ducting** network past **up to 75%** of homes and businesses

Service Providers fund the fibre connection to the home

Fibre ducting network designed to be **complementary** to existing fibre networks

Up to **10,000km** of ducting

Structure

Under this option, the Crown establishes a new company, the Crown Fibre Network Company (CFNC). CFNC is capitalised with the Crown's \$1.5 billion and constructs a national fibre ducting network, of up to 10,000 km of ducting. This competes directly with existing local access Network Operators, and connects with existing fibre feeder/backhaul networks. CFNC outsources all aspects of the network design, build, management and maintenance. We believe Chorus is the organisation best placed to provide CFNC with these services.

CFNC operates commercially, focusing on selling open access to its fibre ducts, but remains in Crown ownership with the possibility of a partial sell-down in the future. CFNC is required to meet non-commercial objectives, such as specific fibre uptake and usage targets, through adjusting its pricing structures.

Investment focus: Open access duct plus fibre for schools and hospitals

CFNC focuses its investment on building a local access fibre ducting network. This is the most challenging component in a fibre to the premise network from an investment perspective, and has not been the focus of significant, co-ordinated, investment in New Zealand to date.

The duct network is designed to connect to ducting and fibre backhaul networks already deployed by Network Operators such as Telecom, TelstraClear, Vector, Velocity Networks, CityLink, Network Tasman, Christchurch City Networks Limited and FX Networks.

Network and Service Providers invest in deploying their own air-blown fibre to the customer's home using CFNC's micro-ducts (likely on a demand-driven basis) and their preferred network architecture.

This provides the Government with absolute flexibility to choose when, if at all, it receives a return, and how much it invests and where. The model can readily adapt to apply to infrastructure beyond ducting if that becomes necessary. If, for example, Service Provider fibre deployment does not eventuate in some regions, the CFNC could deploy its own fibre connections to customers' homes and provide a dark fibre and/or active layer services over it.

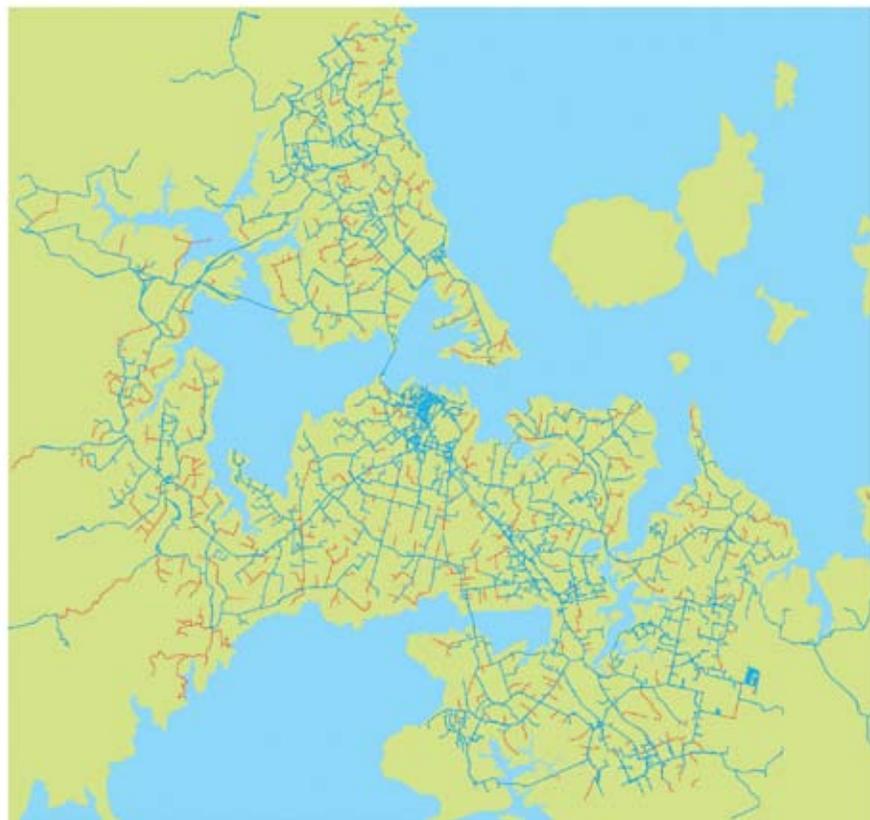
CFNC could also offer a fibre installation service to all Service Providers. CFNC could then set a standard price for installation in all locations and to both sides of the street to average out cost variations, particularly the road crossing cost. This would mean that all Service Providers would not need to develop a fibre blowing capability. It is also likely that a number of private contractors will actively compete in this market making the delivery of these services competitive.

This means the large proportion of the Government's investment is targeted at building new assets for New Zealand avoiding inefficient overbuild of existing fibre infrastructure. In the case of Telecom, it would, for example, enable the CFNC to leverage off the significant investment in additional 2,500km fibre feeder we are currently making as part of our FTTN programme. In Auckland alone, for example, we are deploying 1,200kms of new fibre, in addition to the 2,350kms we have already deployed:



Telecom's existing and planned fibre in Auckland

TELECOM FIBRE OPTIC NETWORK: AUCKLAND REGION



■ EXISTING FIBRE OPTIC CABLE – 2,350km
■ PLANNED FIBRE OPTIC CABLE
(INCLUDES 1,200km BY 2012 FOR FIBRE TO THE NODE)



Schools, hospitals, businesses and greenfields

CFNC's initial focus will be rolling out fibre ducting to businesses, schools, hospitals and community centres. Individual Network and Retail Service Providers will then be able to deliver services to those sectors on their own fibre, utilising CFNC's access ducts, or via third party Network Providers.

The extent and speed of this initial deployment depends on the commercial arrangements struck by CFNC. The timeframes to connect those schools and hospitals within the 75% coverage zone could be expected to be similar but slightly slower than Option 1. Connecting schools and hospitals outside the 75% coverage zone requires significant backhaul fibre deployment, and commercial arrangements and co-ordination with existing backhaul Network Providers.

The CFNC determines which schools to prioritise, and could extend fibre ducting for schools and hospitals beyond the 75% coverage area, as proposed in Option 1. Under any option, we think there are significant benefits to be achieved from connecting 100% of schools and hospitals.

In areas where businesses are not already adequately served with fibre connectivity services, CFNC would deploy fibre ducting. Similarly, CFNC would install fibre ducts in all new greenfield developments.

Infrastructure for FTTP to 75% of homes

CFNC's next objective would be to deploy access fibre micro-ducting to the homes within the 75% coverage area. This residential ducting network is complementary to existing fibre infrastructure. It will be deployed down every street in the 75% coverage area, and contain an individual micro-tube for every house, back to a local network aggregation point or node. To help limit the size of the aggregation nodes and ducts, the nodes will likely be designed to serve between 200 and 300 homes, similar to the model we have used for our FTTN cabinets.



CFNC will locate its management and micro-duct aggregation nodes at the most efficient points having regard to the location of existing Network Operator's interconnection nodes, so that its ducting network can connect seamlessly with existing feeder/backhaul networks. CFNC will also design the nodes to accommodate multiple fibre network architectures, such as PON or AEF. It will need to accommodate the Service Provider equipment for these different architectures at each aggregation node.

Open access

The CFNC provides open access to its ducting network based on access terms set with the CFIC. This enables the Government to have complete control over when, or if, the CFNC is to make a commercial return.

Option 2 enables all Service Providers to have open access to the base infrastructure necessary for fibre to the premises, and to make their own commercial decisions about how to design a commercial business case for FTTP services. It enables multiple Service Providers to each deploy their own fibres into customer premises where there is demand.

Service Provider perspective

Service Providers enter into commercial arrangements with the CFNC.

The service that a Service Provider purchases from the CFNC is similar in concept to the UCLL Sub-loop service that is in the final stages of being determined by the Commerce Commission. The key product is a sub-loop micro-duct between the customer premises to the duct management point (Fibre Node). That is also the point where the Service Provider connects with their own feeder fibre or purchases feeder fibre. To facilitate interconnection, the CFNC also provides a co-location service at the Fibre Node for fibre management equipment, PON splitters or any other equipment Service Providers need to deliver their services.

The first time a customer orders services for a premises CFNC will deploy a lead-in duct. CFNC would provide a different service for a first time install than for when a customer changes from one Service Provider's service to another.

An agreed industry code will cover how a customer changes from one Service Provider to another to ensure the process is as efficient as possible. For instance, it may make sense that the new Service Provider has the choice to buy the lead-in fibre that the previous Service Provider deployed when the end customer was initially connected.

As the Service Provider is the party installing the lead-in fibre to the end customer premises, they will undertake all the home and home wiring services.

A Service Provider, who purchases their feeder fibre service off a third party Network Provider, will also enter into commercial co-location arrangements for housing their service electronics at that Network Provider's Central Office.

We acknowledge that CFNC needs to connect to a multitude of Service Providers, technically for installation and service as well as commercially. The costs and complexity of this environment may be challenging, and lead to conflicts with the Government's requirement for ensuring affordable broadband services.



The challenges and risks of fibre to the premises

New Zealand is a small, long, thin country with a highly dispersed population who live in a high proportion of single-unit dwellings. We face our own challenges to deploy fibre to the premise infrastructure and achieve the Government's vision. What works for a country like Singapore, with its high population density and a predominance of apartment buildings, is not as appropriate for New Zealand.

New Zealanders have shown time and again that we are very good at designing innovative low-cost New Zealand solutions to big problems. We are excited at the prospect of being part of a New Zealand solution for fibre to the premise. Investing in expensive long-term infrastructure assets ahead of demand and mainstream international practice requires that, as a country, we accept some risks.

The Consultation Document does a good job of identifying these risks. We agree with many of them: In particular:

- *Insufficient funding.* On the basis of the numbers outlined in Dr Milner's paper, \$1.5 billion is likely to provide between 20% and 40% of the total cost of fibre to the premises for 75% of New Zealand. Achieving the Government's objective requires private investors to invest ahead of demand. In an industry which IDC¹ estimates to have a total present value of approximately \$5.7 billion, the risk exists that the remaining \$2 billion - \$6 billion may not prove forthcoming from the private sector. This would require the Government to reassess one or more components of its objective. The recent Australian experience, which failed to identify any feasible commercial partners for a far more moderate deployment of fibre infrastructure than contemplated here, illustrates the challenge.
- *Potential for regional Local Fibre Companies (LFCs) to fail.* The economics of fibre to the premise are challenging, and achieving scale advantages is critical, as discussed in Dr Milner's paper. There is a particular risk that smaller regional partners with limited existing scale may fail to become profitable, or find the costs of deploying a passive fibre network greater than expected. This was the experience of several winning bidders in the regional Project Probe process. We also agree with the assessment in the Consultation Document that competition from existing

Network Operators could further undermine the business case for a fibre Network Operator, or a retail Service Provider considering investing in fibre-based services. A regional tender inevitably concentrates investment – Government and private – in a select few areas of New Zealand.

- *Telecom is required to make unnecessary investments.* There is the potential that Telecom could be required, pursuant to our Operational Separation Undertakings, to make investments that may prove to be unnecessary or inconsistent with a re-organised industry structure, such as that proposed in the Consultation Document.

Other commentators, such as IDC, have also raised several additional risks to those identified by the Government, which are also real and significant:

- *Existing private investment in upgrading broadband infrastructure stalls or is crowded out.* There is a significant amount of investment already underway across the telecommunications industry, much of which is directed at increased broadband capability. The Government's proposal may dissuade investors from continuing with their investment programmes if they consider direct Government subsidisation of competing infrastructure undermines their existing business cases. It may therefore discourage foreign investors from investing in the New Zealand market. Ironically, this could lead to poorer broadband performance in the short term, until the fibre is actually installed.



¹ NZ Government's fibre revolution – what happens if we get it wrong", IDC (Rosalie Nelson), 1 April 2009



- *Increased uncertainty for the competitive and regulatory landscape.* Competition and regulation reflect market structure. The Government's proposal will fundamentally alter that market structure, which inevitably introduces uncertainty as to the flow-on consequences of that change to the competitive and regulatory landscape
- *Retail Service Providers with scale may not be willing to invest* in the necessary equipment to provide fibre-based services, or may be hesitant to commit to "anchor tenant" arrangements with fibre Network Operators. The ability of an LFC to attract retail Service Providers with scale to utilise their networks will determine whether they succeed or fail. If retail Service Providers perceive that customers will be sufficiently satisfied with their current DSL-based offers, they may not want to incur the significant up-front costs of fibre service development, and this could be exacerbated if they believe that waiting will prompt the fibre owner to lower its prices.
- *Multiple LFCs lead to fragmented technology, service and interface standards.* The retail Service Providers with the scale capable of supporting a commercial LFC business model are typically national providers of telecommunications or content/broadcast services. These Service Providers require unified standards at the passive layer, the active layer and in the system interfaces by which they interoperate with their Network Providers. Fragmentation of any of these components will

drive cost and complexity into Service Providers' business models. While the CFIC may be able to address some of this risk in its role as an integrator across the LFCs, it will not be able to direct the LFCs, and will have no control at all over non-LFC Network Operators.

- *Advances in wire based technologies match the practical performance of fibre.* There is seemingly no slowdown to DSL based advances. DSL was first developed in the laboratory just over 20 years ago in 1988 by Bell Communications Research Inc. and was commercialised in the late 1990's. Since then, download performance increased from 8 M/bits to 24 M/bits. Already standards for 100M/bits exist, and we expect the distance from the exchange or cabinet from which a home user can access this performance will increase over time. The reason for this development is that this gives continued returns from the world's investment in copper wire as the access to the home. Whilst fibre has higher theoretical maximum speeds, the development of DSL may well meet the targeted 100M/bits in a surprisingly short time frame.
- *Other technological advances significantly change the economics of deploying fibre to the home.* For example, a recently developed technique, called cable de-coring, strips the cable's copper core and replaces it with fibre, which is drawn through the old cable sheath.



These additional risks are as important in our estimation as those set out in the Consultation Document.

We have attempted to address these risks as best we can, within the options we have presented in this paper, by attempting to:

- Maximise use of existing assets and scale advantages, so that we ensure New Zealand gets the most cost-effective and lowest risk solution.
- Design simple governance and operating structures which best enable the CFIC and its partner to make informed, careful trade-offs between investment in ducting and feeder fibre versus investment in customer premises-related costs.

As the Consultation Document suggests, initiatives to promote customer demand for fibre connectivity will need to play an important part in any proposal. Facilitating and encouraging customer demand for fibre-based services will be critical to developing sustainable commercial fibre business cases, which is by far and away the best mitigation tool for most if not all of the risks set out above. These include some or all of the following types of initiatives:

- *Increased Government utilisation of fibre-based services:* Government investment in internet or fibre based Government programmes, such as in the areas of e-learning and e-health.
- *Direct demand-side subsidies* for homeowners to contribute towards the significant cost of the in-house wiring upgrades and/or fibre leads into the house. In much the same way as the Government directly subsidises the costs of solar water heaters, heat pumps and some home insulation, there may well be a case for applying this model to fibre connectivity.
- *Programmes to increase development and utilisation of fibre based applications and services.* Investment in, or cost reductions for, research, development, promotion and production in the area of fibre-based applications and services.

As the Consultation Document also foreshadowed, it will be equally important for the Government to streamline all relevant consenting processes and codes of practice wherever possible to minimise the cost and time of deploying new fibre infrastructure. Similarly, reduced or removed rating on these assets would make a meaningful difference to the business case for deploying them.

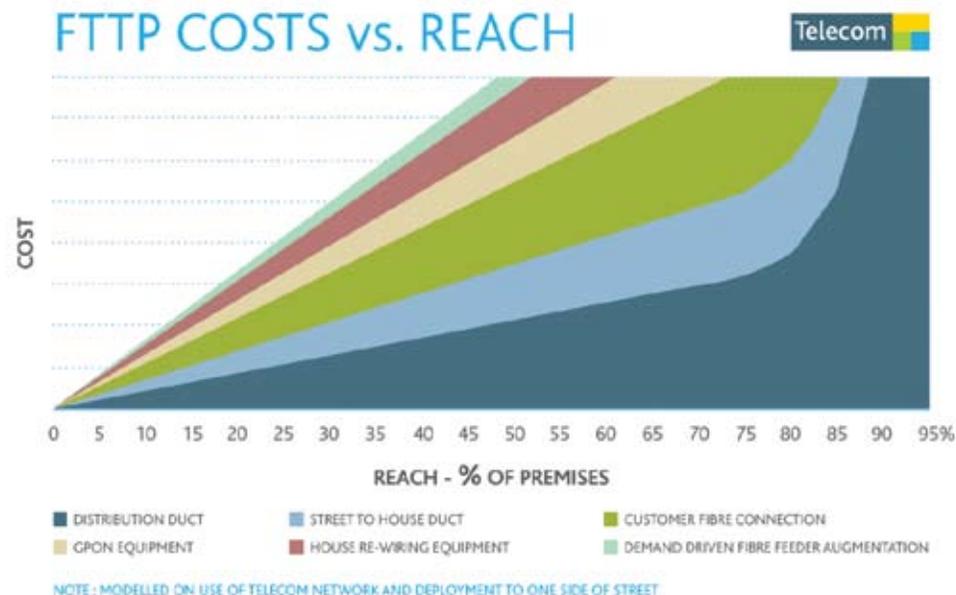


Appendix

Comments on the Fibre to the Premise Cost Study undertaken for the Treasury by Dr Milner

The passive infrastructure required for a fibre-to-the-premise deployment has the following categories:

1. ducts and poles;
2. fibre and fibre sheathing;
3. buildings, usually called 'Central Offices', to act as regional aggregation points and house interconnection equipment;
4. street-side cabinets or boxes where the fibre running down the street can be aggregated into feeder cable and ducts leading back to the central office; and
5. overhead or underground leads from the street into the house or business premise.



Dr Milner's paper estimates the costs of deploying this passive infrastructure to 75% of New Zealand to be between \$2.6bn and \$3.6bn, out of a total estimated cost of between \$3.5bn and \$7.5bn, and we are broadly in agreement with these figures. The FTTP Costs vs. Reach illustration provides an indication of the component costs of a fibre to the premises deployment and their relative size depending on the coverage.

We also agree with much of the analysis in Dr Milner's paper of the civil construction options that a sensible Network Operator would utilise when deploying the passive infrastructure necessary to support a fibre to the premises network, in an effort to reduce those costs as much as possible. These options would include use of whatever existing underlying infrastructure, such as poles or underground ducts, is available, and a mixture of aerial and underground trenching deployment methods.

Aerial deployment will lower costs in some areas, but requires making decisions on trade-offs. Telecom has about 300,000 poles in its current network and we have significant experience using aerial cabling to provide telecommunications services. Aerial deployment has its limitations, however, and will only ever be part of a solution for any roll-out of telecommunications infrastructure. As Dr Milner describes in his paper, while aerial deployment may be cheaper than undergrounding to deploy, it costs significantly more to maintain and has approximately half the asset life of buried cable.¹ Aerial deployment is also much more vulnerable to weather (for example, high winds bringing down poles) affecting service performance and availability.

The other key problem is the concern of councils and communities with the visual pollution created by aerial cables. When deploying a future-proofing technology like optical fibre, it is also important to consider future-proofing the deployment method. Public concern with visual pollution is real, and it is risky to deploy an asset with a 20 to 30 year asset life using a deployment method that might become unacceptable within the asset's life. As Dr Milner notes, some councils actively

¹ Dr Milner notes that the useful life of aerial deployment may be 20 to 30 years, compared to 40 to 50 years for a buried system, while aerial deployment may be up to 50% cheaper than buried systems under standard conditions. Other reports have cited aerial deployment being 30% cheaper under standard conditions. Dr Murray Milner, *Fibre-to-the-Premise Cost Study*, Prepared for The Treasury, 2 February 2009.



discourage the deployment of new aerial plant. He goes on to note that there is no real understanding of the potential for aerial deployment, but suggests a maximum of 30 to 40% aerial deployment under ideal conditions.²

We think ideal conditions are unlikely. For example, public concerns over visual pollution cannot simply be legislated away. We work every day with councils and communities addressing concerns about the legal deployment of telecommunications infrastructure in their communities. Members of the public regularly approach us about placing existing aerial telephone lines underground and in centres such as Auckland there are ongoing initiatives to shift aerial power lines underground. We understand and appreciate how concerned many communities are with further visual pollution, even when the infrastructure creating the concern is providing highly desired services in their communities.

Different trenching options will also lower costs in particular geographic areas

Chorus applies a number of different trenching methods today, depending on the particular characteristics of the area in which a trench is being dug, and its purpose. Dr Milner discusses a number of these trenching techniques in his paper: shallow trenching, micro-trenching, mole-plough trenching, directional drilling and open drilling, and as he notes, new or improved options are emerging all the time.

Ongoing costs of passive infrastructure are also significant

In addition to these initial set-up costs are the ongoing costs. The Consultation Document focuses on the deployment of a fibre to the premises network but appears to be silent on the ongoing operational aspects of such a network. In particular, there is no reference to expectations regarding ongoing maintenance and service reliability of the fibre once it is in place. These costs are significant, and unavoidable.

FTTP active equipment

In order to provide services over that passive infrastructure, you need:

- Optical splitters (in the case of a PON architecture) to split the service provided by a single feeder fibre into 32 or 64 separate fibre feeds to individual premises;
 - Home Optical Network Terminating (HONT) units within customers' premises to convert optical signals to electrical signals;
 - PON Shelves, Line Cards and NT cards – exchange or cabinet based equipment which enables PON services; and
 - Small Form-factor Pluggable (SFP) lasers, which emit the light signals down the fibre.
- Dr Milner's paper estimates the costs of deploying this active infrastructure to be a further \$521 million - \$3.5 billion, depending on customer uptake.

Passive Optical Network versus Point to Point

Dr Milner notes that Passive Optical Networks (PON) are generally the preferred architecture for running FTTP to residential premises, while Active Ethernet over Fibre (Point-to-Point) architecture – requiring active electronics in the loop – is widely deployed for business FTTP connections. This is reflected in Telecom's network deployment today which includes a mix of PON and Point-to-Point (P2P) technology, depending on the required customer solution.

As noted by Dr Milner, PON architecture is less expensive to deploy as it enables fibre sharing in the feeder part of the fibre access, with a dedicated fibre per user in the shorter distribution component. Without active electronics in the loop, PON also has significantly lower maintenance costs and fewer points of failure, increasing service reliability and further reducing operating costs.

PON is likely to be sufficient for residential and small business users in the foreseeable future and, depending on developments in wavelength division multiplexing (WDM-PON) technology, may be an enduring solution. However, the Government proposal appears to advocate in favour of P2P architecture as part of the selection criteria for successful LCFs.

² *ibid*, p. 15.



Telecom considers that the best approach is to build FTTP primarily for PON, while designing it so it supports P2P architecture. We do this by ensuring that the fibre distribution cabinet and feeder ducting can accommodate future feeder side fibre and splicing. This will ensure that, if demand requires, services can be migrated to full P2P over time. This is a smart approach which maximises the bang for buck up front, without foreclosing P2P technology options in the future or risking over-dimensioning the service by wrongly picking developments in WDM-PON technology. The risk of trying to pick WDM-PON technology developments now would be analogous to installing a leading edge ADSL1 technology that foreclosed a later installation of VDSL2.

Many of the passive infrastructure costs and all of the active infrastructure costs are scale-driven: the more of it that is done, the cheaper it gets. New Zealand's size limits the scale economies we are able to realise, but there are ways of maximising these benefits, the most obvious being deploying one, combined, national solution rather than multiple, smaller solutions.

Customer premises wiring

In order for any of the above to work properly, the wiring in every New Zealand home needs to be capable of supporting the speeds that fibre can deliver. Most houses built in the last five to ten years will have wiring of sufficient standard to meet these requirements, but houses built before then – the vast majority – will not. New Zealanders' love of DIY further complicates this picture. Today, even with existing ADSL and VDSL equipment, approximately 20% of faults reported to Chorus staff are traced to faults within customer premises, most commonly wiring. Dr Milner has estimated the cost to individual households for upgrading to a fibre to the premises standard to be between \$333 and \$1,500 per home. We expect this to be a key factor influencing customer demand for fibre to the premises connections.

Chorus is leading a Telecommunications Carriers Forum working party on the subject of premises wiring and has worked with Telecom Wholesale to establish www.brightspark.org.nz to assist homeowners and developers in ensuring their premise wiring is up to standard.



Telecom

