What fibre broadband can do for AUSTRALIA

Do it once!
Do it right!
Do it with FIBRE!
AUSTIN

APRIL 8 – 10, 2014
Renaissance Hotel – Austin, Texas

REGISTER NOW
USD $350
(Save $545 off regular Summit price of $895)
Use VIP Code: AussieNow
(exp. October 16, 2013)

facebook.com/bbcmag
twitter.com/bbcmag

www.bbcmag.com
summit@bbcmag.com

+1877-588-1649
+1281-342-9655
4  KEEP YOUR EYES ON THE PRIZE – HOLD ON
A letter from Scott DeGarmo, CEO, Broadband Communities Magazine
A message to Australians: Hold on to what’s been won – the benefits of an all-fiber network for individuals, families, communities and Australia. Future-proof fiber will bring ongoing advantages.

5  AUSTRALIA LAGS ASIA-PACIFIC NEIGHBORS IN FTTH
Australia’s trading partners are investing heavily in fiber-to-the-home networks. How does Australia place in the lineup?

6  DARE TO DREAM
The NBN’s FTTH strategy offers great advantages for Australian quality of life and economic competitiveness. In contrast, no large FTTN network has ever succeeded with open access, and none is capable of being easily used that way.

8  WHY FIBER TO THE HOME IS THE BEST CHOICE
Top executives explain their decisions.

10  WHY AUSTRALIA NEEDS FIBER
By the time NBN is scheduled to be finished, around 2020, worldwide Internet traffic will increase eightfold. How could a network that relies on old copper lines possibly keep up with that growth?

18  PAUL BUDDE ARTICULATES THE NBN VISION
The Australian expert who helped guide Obama’s broadband stimulus program and who advises the United Nations explains why fiber is the right choice for Australia.

21  ADVANTAGE FIBER
Because the services that can be delivered over copper are limited, a fiber-to-the-node network is unlikely to be financially sustainable in Australia.

24  FIBER SWEEPS ACROSS THE GLOBE
Worldwide, fiber is feeding bandwidth-starved homes, businesses, institutions, communities and countries the digital fuel they need for a new era.

26  FIBER AND BANDWIDTH
The nuts and bolts of bandwidth – what it means and why you need it. Here’s a set of simple explanations in easy-to-digest question-and-answer format.

27  FIBER: THE LIGHT FANTASTIC
Why fiber is the only future-proof communications technology.

29  HOW FIBER COULD ENABLE THE AGRICULTURAL REVOLUTION
Farmers need more connectivity than urban dwellers, not less. It isn’t cheap, on a per-farm basis. But each farm is a business, too – and often several businesses. So fiber’s benefits are greater as well.

30  PAUL BUDDE ON NBN NETWORK TECHNOLOGY
A moderately deep dive into the technical issues concerning FTTH and FTTN.

Articles in this publication were produced by the staff of Broadband Communities Magazine in the United States (www.broadbandcommunities.com or www.bbcmag.com) for distribution there and in Australia. We apologize, er, apologise for the American spelling. This and other special publications are also available at www.bbcmag.com, and the financial models used to produce the charts on pages 22 and 23 are available for download at www.FTTHAnalyzer.com.

Corporate editor Steven S. Ross (steve@bbcmag.com) did most of the writing, and editor Masha Zager (masha@bbcmag.com) did most of the editing. Art director Karry Thomas designed and executed the layout, and Australian artist Krystyna Kappel designed the cover.

Cover caption adapted from Independent MP Tony Windsor’s famous 2010 statement.

Content (except for several images with copyright notices of their own) is copyright © 2013 by BBP LLC, Rosenberg, Texas, USA. Permission is hereby granted to reproduce BBP content free of charge if you include this notice with any article or section reproduced. “Copyright © 2013, Broadband Communities Magazine, www.bbcmag.com. Used with permission.” This publication is posted for free electronic distribution at www.FTTHCentral.com.

Enhancing cooperation.
A major goal of NBN is to coordinate key services such as the electrical grid, emergency services and telemedicine. Pulaski Electric System, a municipal electric utility in Pulaski, Tenn., uses its FTTH network to operate a smart electric grid and deliver voice, video and data to residents.
Keep Your Eyes on the Fiber Prize – Hold On

Knowing what’s at stake gives a powerful motivation to hang in there.

A letter from Scott DeGarmo / CEO, Broadband Communities Magazine

Any Australian reading this publication may want to know, Who is publishing it and what is their real agenda? Fair enough. We are, after all, from the other side of the world. And as we contemplated this venture, we braced ourselves for slings and arrows – utopian idealists … do-gooders … meddlers … Maybe even: troublemakers … agitators … provocateurs.

We don’t think so. This is an educational and fact-based publication about the immense value of a fiber network; even though the NBN continues to be a political issue in Australia, our aims are not political. We champion all the benefits of a fiber-enabled digital transformation – not only better health care, education and government but also economic growth, job creation and innovation – all under the banner of our company mission, Building A Fiber-Connected World. You be the judge.

A WATERSHED MOMENT IN AUSTRALIA

Our U.S. company, Broadband Communities, publishes a business magazine and puts on trade shows and conferences that attract readers and attendees seeking to build fiber networks in various political and economic environments, domestic and international. We’ve seen a lot in the last decade, including struggles, failures and successes. The successes give us a tremendous thrill, and the failures are always painful to witness, causing us to ask ourselves: Could we have helped this town or development by more assertively sharing the information and connections we had at hand? The answer has often been a resounding yes. There’s a special message, in fact, that we think applies to Australia at this watershed moment – a message about holding on dearly to the gains made thus far.

But more on that in a moment. Let me tell you about the readers of Broadband Communities. They are network builders such as municipal officials, telephone company executives and real estate developers. Also represented are Native American tribal leaders, rural spokesmen and advocates for senior citizens, among others. In fulfillment of our mission, we have over the years regularly published special publications such as this one for communities, organizations and companies. We have published versions for European readers and editions in Spanish and Portuguese for the Latin American market. Some of these publications have had as a sponsor the Fiber to the Home Council, a trade association, but often we’ve done them on our own. All represent solely our own independent editorial voice and perspective.

We keep publishing these special publications because we love hearing that our efforts are making a difference. Some U.S. mayors and public officials have distributed them to every home and business in their communities. The publications also indirectly promote our shows and conferences. In all our endeavors, and even though corporate sponsors participate in our shows and advertise in the pages of our magazine to sell their goods and services to our attendees, we consider the value of a fiber network in terms of its benefits for individuals, families, communities and countries. We place the good of society today and tomorrow above the interests of any vendor, corporation or financial entity and as much more important than Wall Street’s drive for short-term profits.

THE VISION AND STRATEGIES ARE RIGHT

Here are the words we have for Australians: Hold on to the gains you have made thus far.

The steadiness of purpose that wins the day in building networks calls to mind for us the words of the song, Keep Your Eyes on the Prize. A pre-World War I folk song that was also called Hold On – and before that Keep Your Hand on the Plow – it originally referred to the “prize” of heaven. With revised lyrics in 1956, it became a staple of the civil rights era, where the prize was not salvation but freedom. Today, and for us, the prize is an all-fiber network – not fiber to the node. Anyone pursuing one will find the path strewn with temptations and distractions. But what’s at stake is bigger than any political party’s agenda.

As Australian network expert Paul Budde advises, by all means take the opportunity to fine-tune the existing plan, but “the vision and the overall policies and strategies are the right ones and you shouldn’t start unraveling them.”

That could be risky. Hold on!

Scott DeGarmo
Australia Lags Asia-Pacific Neighbors in FTTH

With about 1 percent of its households connected to fiber at the end of 2012, Australia lagged far behind China, South Korea and Japan. The numbers are certainly not static. New Zealand is reorienting its broadband policy toward adding more fiber, and Australia itself had doubled its FTTH customers by July 2013.

Data are from OECD except for China (data from China Telecom and IDATE) and Mexico (data from RVA LLC). The percentages include fiber to the basement of multifamily dwellings. Because China is not an OECD member, its data may not be entirely comparable to those of the other countries, and by many accounts its broadband speeds, even over fiber, are fairly low. Australia, New Zealand, and Asia-Pacific neighbors in orange, others in blue.
The NBN’s fiber-to-the-home strategy offers great advantages for Australian quality of life and economic competitiveness.

Just over four years ago, in the midst of a worldwide recession, Australia made a forward-looking decision to use fiber to the home (FTTH) as the key technology for its national broadband network (NBN). Prime Minister Rudd announced that the network would reach 90 percent of all premises (later increased to 93 percent) with fiber optic cable – enough to enable a digital transformation of work, play, education, health care, energy management and government for the entire country. At Broadband Communities – an international publication based in the United States – we applauded the decision at the time and have watched the progress of the NBN with interest since then.

This strategic decision was sound then and remains sound today. Australia’s people and Australia’s economy will benefit far more from a fiber-to-the-home system than from any alternatives. Here are some of the reasons:

- **Copper cannot come close to matching fiber’s upload speeds.**
  - Yet many emerging network uses involve uploads, whether you are placing family videos on YouTube, consulting your doctor or running a business that depends on remote computing services – services in the “cloud.”

- **Even though the latest copper-based technologies can – at least in theory – provide high download speeds, those speeds will be woefully obsolete in five years.**
  - New network uses are emerging quickly. Just one example: Ultra high-definition (4K) televisions are already on the market. They display four times the number of pixels as the highest-resolution sets now in common use, and their prices are fast falling to mass-market levels. 4K video is currently being broadcast in Europe at 40 Mbps; better compression may reduce this, but 4K, especially if there are multiple TV sets per home, will still challenge copper-based networks.

- **To carry high speeds on a copper-based fiber-to-the-node (FTTN) network, old copper must be refurbished, or “conditioned.”**
  - Phone companies usually underestimate the amount of conditioning needed. Conditioning takes time and must itself be paid for. This extra investment is much like the investment in keeping an old car running. Sometimes it pays off, but at a certain point, the repair won’t buy enough additional time to justify the expense. At that point, a wholesale upgrade makes good sense.

- **The social and economic benefits of a copper-based network are limited.**
  - That’s bad enough for a network builder, and it’s an extremely poor choice for a national economy. New industries don’t get started. Citizens’ incomes don’t rise as fast. Entrepreneurs looking to offer new online services and content will have to look elsewhere. Of the large private carriers expanding FTTN – notably BT in the U.K., Deutsche Telekom in Germany, BSNL in India and AT&T in the United States – only BT is committed to bringing significant services from entrepreneurial outside developers to customers. None are willing or able to open their networks to all comers, as is planned for the NBN. **No large FTTN network has ever allowed open access, and none is capable of being used that way.**

A VIEW FROM AFAR

All these issues, we thought, were settled long ago in Australia. But now the argument has been reopened in the white-hot context of political debate. As Australia’s choices have international implications and as the debaters often cite international examples to justify their policies, we take the liberty of offering a view from afar.

Worldwide, capital-starved private network operators often opt for FTTN networks as an interim step toward all fiber optic networks. This allows them to make use of their existing copper lines, which may not even be fully paid for. In general, operators have been disappointed by FTTN’s lower-than-expected performance, higher operating costs and lost revenue opportunities. The most successful large-scale FTTN deployment has been in Germany, where the existing copper was in fairly good condition. But private carriers should not and do not factor national well-being into their overall strategies. That’s not their job. It is government’s job, enforced through regulation or through direct or indirect investment.

All that said, government, like any investor, should strive for efficiency. Money is not to be wasted.

COSTS AND TIMETABLES

Both proposals on the Australian table are expensive by world standards. NBN’s capital plan calls for the mainly FTTH network to cost about $41 billion, or about $5,000 for each household passed. (By contrast, the Verizon FiOS buildout,
which is even larger than Australia’s planned NBN, would cost about $1,200 per household passed if it were getting the same 70 percent uptake rate the NBN is getting.)

The Coalition’s latest plan for a mainly FTTN network calls for an investment of close to $30 billion, again high in comparison to other FTTN buildouts. However, because of the need to condition the old copper, we think it unlikely that FTTN can be built for significantly less than the cost of FTTH.

There are reasons for the differences between Australian and world costs – Australia’s geography and network construction skills among them. There’s also the fact that the FTTH plan was designed for a 50-year lifetime. So if there is a need to lower the cost of the buildout, there may be some tradeoffs that can be made in the design. For example, in some apartment buildings it might make more sense to bring fiber to the basement rather than to each unit.

FTTN’s apparent advantage in deployment time is also unlikely to prove out in practice. True, NBN’s FTTH network was slow to ramp up. However, fiber deployers all over the world have started out slowly and picked up speed once they overcame the initial learning curve, so there’s good reason to think Australia’s fiber-to-the-home network won’t be any different. And the FTTN timetable is likely to be an underestimate because of the time needed for redesign and for conditioning copper cable.

These are just the highlights of what we’re saying in this publication. In these pages, we show how only fiber to the home can provide the bandwidth and other advantages Australia will require as it grows.

Look at the possibilities, and envision what fiber to the home can do for you and for future generations. Then, as countries around the world are doing, dare to dream that Australia, too, can have the infrastructure it needs for the next century. You can’t afford not to.

No large FTTN network has ever allowed open access, and none is capable of being used that way.
TOP EXECUTIVES EXPLAIN THEIR DECISIONS

Why Fiber To The Home Is The Best Choice

We’re on the right path with our fibre strategy.

“Competition is fierce… But we had solid revenue performance again this quarter, thanks to our fibre to the home strategy and we continue to believe that we are on the right path…

“FibreOp has performed very well especially compared to our non-fibre markets – reinforcing our belief in our fibre strategy.”

– KAREN SHERIFF, President & CEO, Bell Aliant Inc (Canada) August 2, 2013

There’s a tremendous difference with fiber.

“… fiber to the home in Spain is absolutely the right technology…

“And you can see… the potential of fiber versus some of the technologies, namely DOCSIS for example, which is probably the other technology that’s in the market. But you can see the tremendous difference in terms of upload and download potential of these technologies. And so therefore fiber to the home is in our consideration absolutely the right and the best choice going forward to cater to some of these customer demands, which are going to be crucial.”

JOSE MIGUEL GARCIA – CEO, Jazztel February 27, 2013

We are growing thanks to fiber. Fiber works.

“What we have to understand with fiber is that it is a wonderful tool and for conquest in many areas – for example, Iles de France, for the first time in 10 years, we have stopped the decline of the growth of the very high broadband, and the first time in 10 years, we are growing thanks to fiber.

“So fiber works, there is an appetite for it and feel for it, the customers, consumers, for the very high broadband services and this really bodes well for business in the future.”

– STEPHANE RICHARD, CEO, Chairman, France Telecom SA February 20, 2013

The fiber business case stands up to scrutiny.

“We are quite happy with the penetrations that we are reaching in terms of fiber. You certainly will have seen in the presentation that we put out how little we have to spend in terms of maintenance repairs or customer care because of the heavy rains with those customers that have fiber. The fiber business case stands also against any scrutiny when it comes to OpEx.”

– ZEINAL BAVA, CEO, Portugal Telecom May 23, 2013
AT&T sees high demand for gigabit speeds.

“It…is 1 million…businesses that we’ll be deploying fiber to -- incremental businesses we will be deploying fiber to over the next two and a half years…”

“Early successes have been above expectation. And where we can go in and deploy fiber and make provisioning commitments that are in the 60 to 90 day time horizon we are taking considerable share, we are having a lot of success. And the receptivity has been very, very high, the brand obviously is very strong when we go in and deploy fiber and then sell behind the fiber. So we’re having really good success. As the build catches momentum you will see this build…”

“And so, we will probably…do our own build in Austin and the business case is actually a very good business case.

“I think you are going to see that begin to manifest itself around the United States, and in not just AT&T and Google. You will see others doing this because the demand for really high-speed broadband via gigabit type fiber-based solutions on a targeted basis is going to be very, very high.”

– RANDALL STEPHENSON, Chairman, CEO & President, AT&T Inc. May 15, 2013

We are signing up more customers with fiber.

“I think the fiber rollout has been progressing very well, and we have continued to sign up more and more customers from our ADSL into fiber, as well as attracting new customers into fiber…”

“And a bulk of our fiber customers are all now majority taking all our services, including our TV service.”

– YUEN KUAN MOON, CEO, Consumer Singapore, Singapore Telecommunications Ltd. May 14, 2013

100 Gigabits per second to customers by 2016.

“Verizon was the first company to deliver commercial long-haul service at 100 Gigabits per second. And our engineers, as they like to tell me, [say] today’s backbone will become tomorrow’s edge. So maybe five years from now or even sooner, Verizon will be selling 100 Gig directly to customers and will have terabytes in the background. So we are more than capable of handling the huge growth in video traffic that we expect to see in the years ahead.”

– LOWELL McADAMS, then President & COO, Verizon January 6, 2011

We’re creating a growth company based on fiber.

“We continue to have confidence that our investments in fiber, combined with the eventual monetization of CyrusOne, will create a fiber-based growth company with significant, sustainable free cash flows.”

– TED TORBECK, President & CEO, Cincinnati Bell August 8, 2013

I should have pushed fiber’s value even harder.

And so…if there is anything that we have done in…the last 12 months where I could have done a better job, it would have been to accelerate the idea that the fiber platform creates productivity opportunities that I probably didn’t push as hard as I should.”

– IVAN SEIDENBERG, then-Chairman & CEO, Verizon September 17, 2009

Ongoing revenue growth seen with FTTH.

“In the consumer and mass markets business, we continue to see positive signs, highlighted by sustained FiOS revenue growth.”

– FRAN SHAMMO, EVP & CFO, VERIZON July 18, 2013
FTTH Is the Best Access Technology for the Future

- **Fiber’s bandwidth is unlimited.** Today, a household with two teenagers in a developed nation such as Australia has, on average, 10 Internet-connected devices such as computers, tablets, smart TVs and smartphones. In 2017, that household will have 25 connected devices, says the Organisation for Economic Cooperation and Development (OECD). By 2022, this will rise to 50. The demand for bandwidth will be unremitting.

  Fiber is truly future-proof. Over the three decades that optical fiber has been used for communications, carriers have simply upgraded their electronic equipment to send pulses of light faster down the same fiber. Separate streams of information can also be sent over many different wavelengths (colors of light) on a single fiber. In this way, a single strand of fiber could theoretically carry the entire world’s communications traffic. This shows how much capacity there is to spare in a fiber network. By contrast, copper technologies edge closer and closer to saturation as the world’s Internet traffic volume doubles every two years.

- **Fiber can support any future applications.**

  YouTube, Facebook, online movies, smartphones, cloud computing, e-books, telemedicine, iPads, graphics-rich interactive online gaming and high-definition TV all appeared in the last decade!

  What’s next? We can be sure innovation will continue at the same rate or faster. Emerging today are 3D TV and ultra-high-definition TV, also called 4K TV because it can display 4 times the pixels of today’s best broadcast television.

Further in the future are “immersive environments,” which will allow people to interact with far-off family and friends as easily and naturally as if they were in the same room. Distance will disappear. Only FTTH will be able to support these new communications technologies.

  Telstra understands what is at stake. Its $40 million venture capital arm has invested in small video startups and in telemedicine, and its officers have made clear that more funding is to come. Clearly, Telstra is poised to sell new services in Australia and elsewhere.

  Naysayers always claim current service levels are “enough.” In 1970, telex and wire service machines transmitted 110 bits per second –
about two words per second, the speed a person can read aloud. Who would ever need anything more? In 1993, a fast microcomputer designed for professional work had a 2 gigabyte hard drive that cost USD$800 – and more in Australia. Today, a 2 GB memory card, if you can find one, costs just a dollar or two. A 1 terabyte hard drive, with 500 times the capacity of that 2 GB drive, costs about $60 in the United States.

If automobiles had improved as much in price/performance, a $20,000 car of 1993 could be had for $533 today.

- **Fiber will give Australia’s national economy a competitive edge.**

  Do you remember Australia’s international isolation in the 1970s? No one today would think of eliminating all but the few thousand voice lines that connected Australia’s phone system to the rest of the world back then. High-capacity undersea cables – all of them made of fiber today – link Australia’s financial institutions, mines, farmers, fishing fleet, tourist centers, transportation hubs, consumers and entrepreneurs to the world.

  And what about Australia’s biggest neighbors and customers – Japan, China, Taiwan, Malaysia, South Korea, Singapore? All these countries are building or have built national FTTH networks. Australia will need a similar infrastructure to continue to participate as an equal economic partner.

- **Rural areas and disadvantaged groups are less likely to be left behind with FTTH than with FTTN.**

  In the United States, FTTH is often cheaper to build in rural areas than is FTTN. Some carriers that provide FTTN-based services in smaller towns are extending fiber to the homes of outlying customers with the intention of converting five-year-old FTTN to an all-fiber network.

  The reason is simple: Nodes in an FTTN system cannot be more than 3 or 4 kilometers from customers. That’s as far as copper can carry bandwidth (barely) sufficient to meet today’s needs. On fiber, a digital signal can be carried without degradation for 20 to 40 kilometers and sometimes even farther.

  In addition, fiber provides the reliability and bandwidth that are needed to transform the economies of disadvantaged regions. In the United States, FTTH is strengthening the culture and economic well-being of Native Americans who have lived for many years in isolated communities.

Fiber broadband services compete strongly even against up-to-date cable services.
Why Australia Needs Fiber

FTTH Is the Best Access Technology Today

- Consumers are most satisfied with fiber to the home. Market research in the United States consistently reports higher consumer satisfaction with FTTH compared with the service provided by FTTN, cable or wireless connections. Consumers like FTTH because it offers better bandwidth (both downstream and especially upstream), more consistent service and fewer service calls. Both customers living in single-family homes and customers in multifamily apartment blocks agree on the desirability of fiber.

  That’s why in the United States overall, FTTH network providers enjoy an uptake rate close to 50 percent, often against entrenched incumbents. The rate often climbs above 80 percent in areas where there is no wireline broadband competition – greenfields and rural areas especially. Large-scale FTTN networks average less than 40 percent.

- FTTH can easily support today’s popular and emerging applications. Fiber-to-the-home users never complain about stop-and-start buffering when they watch online video. Consumers and businesses back up and store their documents, photos and videos in the cloud and access them from anywhere. They participate in online classes, conferences and medical consultations in real time. Businesses with fiber connections expand their computing power on demand, at a moment’s notice, through facilities such as elastic computer clouds. Students check out software programs and books online from the local library and access them from their home computers. Researchers operate high-tech equipment remotely.

  Best of all, no one ever accuses a fiber-to-the-home user of being a “bandwidth hog.” There’s always plenty of bandwidth to go around.

- FTTH increases property values and rental income.

In Australia, fiber uptake rates are even higher than in the U.S., reaching nearly 70 percent in the areas where FTTH was rolled out first.

- FTTH has the lowest cost per Mbps in U.S. FTTH networks can provide more bandwidth for the same price as other network technologies.

FTTH is the Most Stable Platform: Reported Monthly Required Reboots

<table>
<thead>
<tr>
<th>Technology</th>
<th>Monthly Reboots</th>
</tr>
</thead>
<tbody>
<tr>
<td>FTTH</td>
<td>1.1</td>
</tr>
<tr>
<td>Cable Modem</td>
<td>1.6</td>
</tr>
<tr>
<td>FTTN/DSL</td>
<td>2.5</td>
</tr>
<tr>
<td>Wireless</td>
<td>3.2</td>
</tr>
</tbody>
</table>

One reason customers are satisfied with FTTH is that it is extremely stable.

High Percentage of Current U.S. Providers Say They Will Continue Building FTTH

<table>
<thead>
<tr>
<th>Provider Type</th>
<th>Very or Somewhat Likely</th>
<th>Very or Somewhat Unlikely</th>
</tr>
</thead>
<tbody>
<tr>
<td>FTTH</td>
<td>58%</td>
<td>14%</td>
</tr>
<tr>
<td>Not Applicable: All have FTTH/Will Soon</td>
<td>28%</td>
<td>14%</td>
</tr>
</tbody>
</table>

FTTH has the lowest cost per Mbps in U.S.

<table>
<thead>
<tr>
<th>Technology</th>
<th>Cost per Mbps</th>
</tr>
</thead>
<tbody>
<tr>
<td>FTTH</td>
<td>$2.64</td>
</tr>
<tr>
<td>Cable</td>
<td>$3.68</td>
</tr>
<tr>
<td>FTTN</td>
<td>$6.40</td>
</tr>
<tr>
<td>Wireless</td>
<td>$17.60</td>
</tr>
</tbody>
</table>

FTTH networks can provide more bandwidth for the same price as other network technologies.
Surveys in the U.S. report that home buyers would pay a 2 to 5 percent premium on the price of a single-family home or condominium unit that has access to FTTH. They would also pay a premium of 15 percent to rent a multifamily unit with access to fiber broadband.

- **FTTH supports small and home-based businesses.**
  Many broadband homes support home-based businesses, but the likelihood of having a home-based business increases significantly with FTTH, which is faster and far more reliable than other modes of broadband. In the United States, the extra home-based business activity that FTTH made possible amounted to USD$42 billion in 2011 alone. Broadband Communities magazine estimated that the 1 percent of the 2009 $700 billion economic stimulus package that was devoted to telecommunications generated about 10 percent of all new jobs.

- **Fiber is less costly to maintain than copper.**
  Verizon, which has deployed more FTTH – about 18 million homes passed – than all of Europe combined, reports to its shareholders that operating and maintenance costs for FTTH are radically lower than for its old copper wiring.

  Fiber optic cable has been used for long-haul communications for more than 30 years, and evidence suggests it is almost impervious to heat and water, immune to lightning strikes and even somewhat resistant to massive flooding.

  In October 2012, Hurricane Sandy caused a huge storm surge in New York City. Cable vaults serving all telecommunications and cable TV operators were flooded, as were many central telephone exchanges. Verizon’s all-fiber system was back in service within days in some cases and easily beat other providers’ recovery.

  Fiber optic cable simply lasts longer than copper cable. That’s why Technology Futures Inc., a leading expert in telecommunications valuation that advises all the major North American carriers, recommends depreciating fiber cable over 25 years and copper cable over 15 years.

- **FTTH is a greener technology.**
  Studies by a Paris-based subsidiary of PriceWaterhouseCoopers show that FTTH deployed in Europe and in the United States has a lower environmental impact than copper-
Why Australia Needs Fiber

FTTH attracts more innovative service providers than does FTTN.

**FTTH is best environmentally, using less energy and resources than copper.**

U.S. study, more than 13 percent of FTTH subscribers were able to work from home more often – a monthly average of 7.3 more workdays at home. Imagine all the petrol they save!

- **Australia’s NBN, with its “structural separation” model,** stands a far higher chance of attracting innovative service providers to an FTTH network. Retail service providers have problems with FTTN. They can’t guarantee speed or reliability, which vary with distance from the node and fall short of fiber’s speed and reliability in any case. New services such as video security, cloud computing and home health care rely on robust upstream as well as downstream bandwidth, where fiber’s advantages over FTTN are even more apparent.

Aside from bandwidth issues, FTTN requires more maintenance and has fewer built-in tools for monitoring potential problems before they affect customers. That’s another reason it has rarely been used for open-access networks: There is too much opportunity for network operators to shunt the blame to others.

**Investment in FTTN May Be Stranded**

- **FTTN technology is nearing the end of its life cycle.**
  Clever technologists are squeezing every last drop of bandwidth out of copper networks. You will hear about vectoring, bonding, G.fast, and other innovations. It’s true – copper can carry more bandwidth today than it could five or 10 years ago. But there are several things to keep in mind:
  - Copper can carry high bandwidths only over very short distances.
  - Copper can carry high bandwidths only over very good (that is, new) copper cables.
  - Copper is reaching the end of the line. There is no long-term upgrade path for copper.

Utility regulators usually are furious at carriers that invest in short-term, band-aid and gaffer tape solutions. Short-term solutions require little cash upfront, but they don’t last long. Fiber to the node (which depends on DSL technology from the node to the customer’s house) is advocated in Australia with the idea that the network, whose completion is optimistically promised by 2019, will then be adequate for at least another 10 to 15 years to amortize the installation cost.

If the network has to be replaced (and that means upgraded to fiber) ahead of schedule, the investment put into it will be “stranded.” People make those choices every day. Is it wise to put $1,000 into that old car? Or will another, bigger repair likely be needed next year?

By 2019, worldwide Internet traffic will be eight times higher than it is today, given that it doubles every two years. By 2029, it would increase another 32 times, or about 250 times in total more than today’s traffic. Nothing on the horizon – no technical innovation available today, or even on the drawing boards – will allow ancient copper wire to handle that traffic. But today’s FTTN investment would have to last about that long to be worthwhile – and during that time, customers would have to put up with poor, unreliable service using a technology long since abandoned by the rest of the Asia-Pacific region.

- **FTTN invites competitive overbuilds.**
  If NBN can deliver the advantages of fiber to only 20 percent of Australian households, many other households will be tempted to turn to competitive overbuilders—network operators that look for small, profitable areas in which to supply the services that NBN cannot or will not supply. BT in the United Kingdom, AT&T in the United States and other large operators that have selected FTTN as their primary
strategy are now finding competitive overbuilders siphoning off many of their best potential customers.

This diversion of the most profitable customers will be a serious problem for the financial sustainability of NBN itself, as its network will not achieve maximum efficiency and its overhead costs will be spread among fewer customers.

By contrast, there is no documented case anywhere in the world of an incumbent operator’s building an FTTH network and seeing an overbuilder move in and successfully compete against it.

• To implement an FTTN strategy, the country will need to train its workforce in an obsolescent technology rather than in the technology of the future.

If NBN fails to deliver the speeds customers want, overbuilders will move in.

Skill in building and operating fiber-to-the-home networks is salable around the world, as such well-known Australian consultants as Paul Budde can attest. Fiber networks now are accessible to more than 200 million households worldwide, or about 10 percent of all households.

With NBN technology seemingly settled, Australia has, at some cost, been reorienting its training toward fiber for several years. Although many of the workers building the NBN were indeed originally trained in copper, many are not – and probably few of them were trained in the advanced copper technologies needed for FTTN.

Whether Telstra even has the personnel needed to do what the Coalition has asked – spend 60 to 90 days to determine whether re-engineering NBN to FTTN standards is worthwhile – is unclear. It is also unlikely that NBN has the trained manpower to install the 50,000 to 70,000 nodes necessary to build the NBN as an FTTN network or to test the condition of old copper lines.

FTTH Can Be Built at Acceptable Cost in Most Areas

• FTTH is often less expensive than FTTN.

It is not at all clear that the upfront construction cost of FTTN is cheaper than FTTH in all cases – or even in most cases. An FTTN network with 50 Mbps download speeds brings fiber within 1 km of end users (in the best-case scenario, with bonded pairs) and probably within 500 meters. In large, dense cities, where most Australians live, fiber would pass many homes on its way to a node – and because fiber distribution points are more scalable than copper nodes, the fiber could be connected to those homes without traveling so far.

Broadband consultant Paul Budde notes that when KPN in the Netherlands began building its FTTN network, it found the network was not as cheap as originally envisaged. The fiber often passed 70 percent of the homes on the way to a node – and because fiber distribution points are more scalable than copper nodes, the fiber could be connected to those homes without traveling so far.

In multifamily dwellings, fiber may be used throughout the structure, as it is thinner and more flexible than Ethernet or coaxial cable, and thus easier and cheaper to deploy. But where there is existing good copper cabling, bringing the fiber to the basement or somewhere else it can be connected to the wiring may make good sense.

If there is no existing copper, as in new construction, network builders around the world favor fiber. In the United States, AT&T, which has mainly built FTTH to reserve its capital for improving its cellular network, uses all-fiber networks in new apartment buildings and new single-family developments.

In medium-density suburban areas with good existing copper – areas constructed in the last 25 or 30 years – does FTTH have a clear short-term cost advantage, and FTTN may also be faster to deploy in those areas. However, even in those cases, operating and maintenance costs of FTTN are higher, reliability is lower, and the benefits are much lower.

• FTTH may be more economical than FTTN even when it is more costly.

Suppose FTTH costs twice as much as FTTN to deploy but also allows more customer choice of content and services. Even after accounting for the cost of the network, the FTTH option is likely to have

Rural areas have been served with FTTH less expensively than with FTTN.
Why Australia Needs Fiber

Why? Specialized services, each of interest to only small sectors of the population, are easier to carry on FTTH and offer higher benefits to consumers (and higher margins to retail service providers). Verizon, with average monthly revenue of over USD$150 for its FTTH network, makes a gross profit of more than $50 per month per customer while charging the same or less than competitors for basic voice, video and data services. Its competitors that use copper-based networks average a gross profit closer to $25 – half the profit on two-thirds the revenue.

To model the costs and revenues of an FTTH network and verify that higher costs can actually lead to higher benefits, use the financial models developed for Broadband Communities, which are available for free download at www.FTTHanalyzer.com.

These models, though developed for the U.S., are applicable to Australia as well. Australia is roughly the size of the continental United States and has about a tenth the number of households – but, surprisingly, it is more urban. Ninety percent of Australians live in urban areas, while only 86 percent of Americans do. The most important density measure – the number of households per kilometer of paved road – is almost identical in both countries, at about 25.

• FTTH costs and timelines are more predictable.

NBN as currently designed is supposed to cost $41 billion and be completed by 2021. The Coalition’s FTTN proposal is supposed to cost about $30 billion (an admittedly rough estimate) and be completed by 2019. Our guess, based on experiences worldwide, is that both plans will end up costing more than the estimates but that the cost of the FTTN plan is more likely to balloon.

The reason: In addition to the FTTN estimates being rougher

How Big Is A Gig?

Today, fiber’s bandwidth is orders of magnitude bigger than other technologies. As the new generation of 10 Gbps equipment is deployed, the fiber circle will move off the page.

U.S. home-based businesses using FTTH have added billions to the economy.
FTTH Supports Robust Wireless Access For Mobility

- Fiber supports cell tower connections and Wi-Fi clouds. Wireless communications are wireless for only very short distances. Basically, wireless will not work in today’s world without robust fiber networks.

  At the base of most cell towers is a copper or fiber cable that connects the tower to the national communications grid and, through that grid, to the world. Australia enjoys the largest smartphone penetration of any country – about two-thirds of all Australians have smartphones, and there are more cellular phones than people (including infants) in Australia!

  Worldwide, cell towers’ copper connections are being replaced with fiber at a breathtaking clip. That helps. But there are theoretical limits to how much bandwidth can be carried by a given amount of wireless spectrum, and that spectrum is in short supply worldwide.

  How fast are we brushing up against those limits? Well, the volume of wireless communication has increased 200-fold in the United States since 2008 and will increase another eightfold by 2016. That’s an astounding 1600-fold in just 8 years!

  In urban areas, the physical limits of cellular networks are being reached already. This is why in many parts of the world, Wi-Fi is already supplementing cellular signals outdoors. Wi-Fi, too, is becoming saturated in cities such as New York – cities with roughly the same population and business density as Sydney and Melbourne. Cells are covering less and less space, often just half a city block.

  • Fiber supports small cells. In the United States, Japan, Korea and elsewhere, the solution to cellphone signal congestion is deceptively simple: Smartphones increasingly make use of users’ own Wi-Fi networks. Thus, a user’s broadband connection is used to carry cellular traffic, often automatically.

    Should home users entrust their phone calls to Wi-Fi? Only if their broadband connections are reliable and have enough upstream bandwidth. And that means fiber, with a clear digital signal – clear enough to hear a pin drop – all the way to the nearest telecom hub.

    How are businesses to handle workers who bring their tablets, laptops and smartphones to the office? Again, Wi-Fi hotspots in the office, tied to a fast fiber network, offer the only realistic solution.

Paul Budde is one of the world’s foremost telecommunications management and marketing consultants. He provides independent advice for investors, businesses and governments on the telecommunications, broadband, mobile, infrastructure and the digital economy markets.

For the latest news and free reports visit us on: paulbudde.com
Q: What will a fiber-rich NBN make possible that FTTN will not?
A: We need fiber for
• Massive increases in data traffic – we need enormous high capacity.
• High reliability for e-health, e-business, and many other new applications.
• Low latency for cloud computing, gaming and M2M (controlling devices from the cloud or mobile applications).
• Robustness – the Internet is now so important to the economy that it has become too big to fail.
• Maximum security and privacy.

Each application on its own could, for a certain period of time, still be delivered over good-quality copper or coax networks – some, perhaps, forever. But that is not the point. All the applications together need to be carried over an infrastructure that can handle the lot. If your vision is broad enough to include the digital economy and digital productivity, then fiber to the home is the only way.

Q: You have noted the “widespread support” NBN has received from subscribers. What are people excited about?
A: In the running up of the national infrastructure project, the Australian Telecommunications User Group undertook a survey that indicated a high level of support for the NBN – between 70 percent and 80 percent support. Research from Macquarie Telecom and the government over several years has also shown a similar level of support. A range of other polls have been undertaken, with perhaps the low point two years ago.

In general, people in Australia get it. I have been on numerous talkback radio shows throughout the country, and I never encountered listeners who said they didn’t want the NBN. In regional areas, the quality is the key issue; people simply ask for a better broadband connection.

Most people seem to intuitively know that this is good either for themselves, their kids or their grandchildren. Most grasp the basic concept and the need for e-health, digital productivity, smart grids, e-educations and so on. People understand modern complexity far better than politicians and the media give them credit for.

Q: How is the outreach to potential users progressing?
A: Australia is unique in having “demand-side” policies, which were implemented starting in 2010. There are now close to 100 projects around Australia that are developing these new applications in health care, education, culture, art, indigenous services and so forth under the National Digital Economy Strategy (NDES).

This demand-side approach runs in parallel with the rollout of NBN’s supply-side policies, and it is unusual. Internationally, governments still grossly underestimate the need for demand-side and supply-side policies to go hand-in-hand. Most governments are involved only in the supply side. Thus they will fail to deliver the benefits they are aiming for.

In other countries, there are literally thousands of e-health, e-education, smart grid and other pilots, but without an integrated digital infrastructure policy as we now have in Australia, these thousands of pilots worldwide have not been able to scale up to mass-market levels. They simply die after the grant money is gone. I call this “death by pilots.”

Q: Why are people taking NBN service in such large numbers where it is available?
A: Because it is affordable. Entry-level pricing starts at $29.95 a month. In areas where the rollout started some 18 months ago, we see uptake rates growing toward 70 percent. And because of the high uptake, all those social and economic services mentioned above will be developed. Because of the ubiquity of this uptake, the personal, business and national benefits will be great. You can’t have half of the population not being able to access e-health, for instance.

Q: Have people been discussing the future, the potential? Obviously, the future is sooner than most people think!
A: Yes, people already see the broadband squeeze that is occurring in their homes, with all those smartphones, tablets, Internet TV and game modules linked via Wi-Fi to

If your vision is broad enough to include the digital economy and digital productivity, then fiber to the home is the only way.
their fixed broadband connections. The high demand for mobile broadband creates a direct need for an increase in fiber networks, which carry the bulk of the traffic generated by these mobile devices.

Most people now work with pictures, video, games, Skype, images and so forth, and it is not too difficult for them to understand that a better infrastructure is needed. Innovations are happening so fast that they don’t need to delay decisions; at the right price, they simply move on to the next level of broadband as soon as it becomes available to them.

Q: What is the role of information and communications technology (ICT) in the Australian and world economies?
A: There is no way we can run our societies and economies the way we have done since the end of WW II. There is an economic and financial crisis, an environmental crisis, a looming health care crisis. Globally, the planet has grown from 2.5 billion to 7 billion people and most likely will reach 9 billion before I die.

We need to take a far more holistic approach in facing these challenges, and ICT can be the conduit. Rather than trying and failing to fix these problems within the current silo approach, ICT can help us break through and view all silos.

Take, for example, health care. Australia’s national research organization, CSIRO, calculated that, if unchecked, by 2040 Australia would have to spend 75 percent of its gross domestic product on health care. That is simply not possible. Services will either skyrocket in price or will no longer be delivered. We need to use e-health to avoid these outcomes, and this will work only if all Australians are connected to the NBN.

Smart grids along with communication tools such as M2M, combined with real-time analytics in the cloud, can result in a 30 percent increase in energy efficiency, so

- Such an infrastructure needs to be available at affordable costs to people (eventually at a basic level perhaps even free of charge at all so the whole society can benefit from each user’s connection).
- Utilities – including health care – should be able to use the NBN either free or at a very low price as the national (not necessarily individual) social and economic benefits they deliver are many times bigger than the costs of their using the NBN.
- Access to the NBN (including M2M) needs to be ubiquitous.

If you take all that together – high capacity, high reliability, robustness, low latency, affordability and ubiquity – I would challenge any ICT engineer or

Can you afford not to have a national all-fiber network?

Like an app store.

Customers in many Swedish towns served by local open-access all-fiber networks use software like this from COS Systems to choose from among hundreds of different services that rent space on the network. Note the different tabs for residential, business, NGO and student customers.
Data centers and cloud computing investments are skyrocketing in Australia because they need the best possible infrastructure.

politician to argue against FTTH. From a government perspective, I would ask them: Can you afford not to have a national all-fiber network?

Q: How will entrepreneurs make use of an all-fiber NBN?
A: International companies are expanding in Australia because, for the first time, they will be able to look at applications and customer behavior based on a large-scale, open-access FTTH deployment. Data center and cloud computing investments are also skyrocketing because they need the best possible broadband infrastructure. Many of these companies are also taking high public profiles in promoting the social and economic benefits of the NBN.

Q: Are there things you would change in NBN to make it better, cheaper or faster to build?
A: For any massive infrastructure project, I am all in favor of regular checkups, especially if the company is a utility monopoly – and that is what NBN Co is. The ICT industry is the most dynamic of all, so we need to take advantage of new technologies, new ideas, new ways of doing business.

A new government has a golden opportunity to use that situation to do an audit and see if we are still on the right track and where we can improve. I am certainly not saying we should change the vision, strategy or policy, but within that context, we should fine-tune wherever we can.

Q: What might a review show?
A: We have the vision right in relation to national utility, structural separation, social and economic benefits and NDES. But sadly, because the NBN Co business model is still purely a telco model, it doesn’t take the social and economic benefits into account within its financial model. So while NBN Co might want to pursue these non-telco benefits, it gets punished — it is not rewarded for this within its current business model.

Let me put it another way. The biggest mistake countries are making in relation to their digital infrastructure is that they see it as being regulated by telecom policies. Traditional telecommunications is only a small part of what this infrastructure is all about, and currently this debate and its developments are hijacked in most countries by telecom companies with their own very narrow self-interests.

It is essential that governments see broadband as national infrastructure for all the social and economic benefits I’ve mentioned.

The structural separation of Telstra [separation of infrastructure from services], which released it from upgrading an ailing infrastructure, transformed the company beyond recognition. It is now fully cooperative not just with the government but also to a very large extent with the rest of the industry.

Q: Can the rest of the world follow Australia’s lead in building a national fiber-to-the-home network?
A: While I very much like the Australian all-fiber approach, in my position as a special adviser to the U.N. Broadband Commission for Digital Development, I fully realize that very few countries are in a similar situation. I am involved in many NBN business models that are now being adopted in more than 130 countries. Most of these countries will use mixed technologies and slowly push fiber closer and closer to end users and thus deeper and deeper into society.

This is happening now in Africa, where the booming mobile broadband market requires a rapid and deep rollout of fiber networks. This will be a slower process, but in the meantime, many applications can run on current infrastructures in isolation. Looking at some of the broadband adaptations and broadband entrepreneurship in Africa is just mind-boggling. Just look at the self-education applications alone!
Australia’s NBN is intended to be an open-access network with one network owner and a theoretically unlimited number of content creators and distributors. As is typical in such arrangements, a publicly owned entity or publicly supported consortium builds the network and rents bandwidth to providers of content and services. In Europe, for instance, about a third of all fiber-to-the-home projects (accounting for about a quarter of the homes with access to fiber) are built by public-private consortia. In Singapore, a single, government-supported company built an open-access network. Australia has chosen the same model.

The Labor Party chose to provide free fiber connections wherever this was deemed practical – 93 percent of all premises in Australia. (There is some provision for other subscribers to pay to connect to the network, but this is a very minor part of the plan and only one business had done so as of July 2013.)

The Coalition, by contrast, proposes (at least at the time we went to press) free connections for most premises to a fiber-to-the-node network. Any FTTN subscriber could then pay the cost of connecting his or her premises to the network via fiber if needed. Proponents of this plan have suggested that, eventually, the NBN might become an all-fiber network that cost the same as the network envisioned in the Labor plan, with the difference being that the last-mile fiber buildout would be much slower and the fiber connection costs would be borne by users rather than by NBN Co.

Whether the last-mile fiber costs are borne by NBN or by users isn’t very important, and there are good arguments to be made on both sides. Ultimately, users must pay for their connections either directly or indirectly.

Rather, what matters most to the success of a network is its revenue potential: How much revenue a network can earn and how fast it can start earning the revenue. Even a nonprofit network operator such as NBN Co must cover its costs if it is not to be an ongoing burden to taxpayers. In what follows, we compare likely timetables and revenues of the two proposed NBN plans and ignore the possibility of user-financed extensions of FTTN to FTTH (which would add more time and expense to the FTTN plan).

**CONSTRUCTION TIMETABLES**

With regard to how fast the network can be built, there is little to choose between FTTH and FTTN. Certainly, NBN in its current form has a long way to go. As of June 2013, NBN had passed 220,000 premises. Of these, about a quarter cannot be hooked up immediately because they are in large buildings, typically older apartment blocks, that lack internal wiring to support the network. However, many older buildings can indeed be wired quickly. For example, Verizon, the largest FTTH carrier in North America, took only nine weeks to bring fiber directly to all 11,250 apartments in the 110 buildings of New York City’s 1940s-era Peter Cooper Village/Stuyvesant Town complex. Since then, the technology for placing fiber optic cable in such buildings has been made even easier and faster.

Theoretically, FTTN should take less time to build than FTTH because it would use at least some existing copper communications lines. In practice, there would be a considerable delay to redesign the network. There would also be inevitable delays due to fixing old copper wiring to carry high-speed services. Amazingly, phone companies have almost universally underestimated that problem. Over the years, copper wire is patched, added to, twisted around and rerouted out in the field. As long as it works for whatever communications are required when the repairs are done, no one at headquarters seems to notice – until they know the fine points of what services it can offer in which locations.

But what if you are a bright entrepreneur with a great new idea for a broadband service? If NBN is almost entirely fiber, almost every customer can get the same service quality – the same speed, the same reliability. Subscribers all over the country can use your service.

FTTN is entirely different. Because FTTH is far more reliable and uses far less energy to operate, and because it is faster than FTTN (much, much faster on uploads), an all-fiber network seems intuitively likely to attract more revenue. Evidence shows fiber’s revenue advantage to be even greater than casual predictions suggest.

In fact, operating Australia’s NBN as a fiber-to-the-node system may not even be possible. Although several private carriers have built large FTTN networks, no other open-access national network of this size has ever been attempted using FTTN.

The biggest reason, aside from fiber’s speed and reliability advantages, is that third-party service providers do not trust FTTN to deliver the goods. A private carrier such as AT&T in the United States or Deutsche Telekom in Germany can build FTTH with some confidence and choose to provide only the services that the network can carry. The private carrier understands its network and knows the fine points of what services it can offer in which locations.

What Fibre Broadband Can Do For Australia
Advantage Fiber

A SIMPLE FINANCIAL MODEL
The financial model used here was developed for the U.S. but is applicable to Australia as well. Australia has about the same land area as the lower 48 states of the United States, excluding Alaska and Hawaii. There are other similarities.

In building a communications network, the most important cost drivers are the degree of urbanization and the number of potential customers that can be reached from the road.

Although Australia has less than a tenth the population of the United States – 22 million versus 330 million – the degree of urbanization is similar. In fact, Australia is more urbanized (90 percent of the population) than the United States (82 percent). Twelve million Australians live in just the five cities of Sydney, Melbourne, Brisbane, Perth and Canberra.

The number of premises per km of paved road is also similar – about 26 for Australia and 24 for the United States. Thus, we can use a similar model, but with Australian costs, to get a rough estimate of how revenue affects the financial sustainability of the network.

We assume the budgeted NBN cost per km for both FTTH ($40 billion divided by 356,000 km of paved roads) and FTTN ($30 billion divided by 356,000). We also assume $50 gross profit per month for services provided by FTTH and a generous $37.50 a month for FTTN, as FTTN cannot deliver as many high-margin services as fiber. This is a plausible scenario, not a prediction.

For details, see the article “Profiting From Broadband” in the July 2013 issue of Broadband Communities.

In the U.S., the network owner is usually also the service provider, but that makes almost no difference to what the consumer ultimately pays – the indicated profit may go into a different pocket, but one way or another it is still needed to amortize the cost of building the network in the first place.

Even the very rough estimate in Figure 1 shows FTTH one-third more profitable than FTTN. How can that be true if the per-km cost and revenue of FTTH are both a third higher than that of FTTN? The answer is that the bottom line is also higher!

In actuality, FTTH is an even better deal. That’s because this initial run of the model assumes all households will sign up for the network at the same rate whether they are offered FTTH or FTTN. Clearly, the uptake rate will not be 100 percent in the near future. However, experience in the U.S. (based on quarterly reports of large telecom companies) shows that the percentage of customers taking FTTH is much greater than the percent taking FTTN.

One reason FTTH networks have lower uptake is that competitors are more likely to overbuild them with better networks. For example, AT&T’s FTTN network in Austin, Texas, is being overbuilt with FTTH by Google Fiber – which is causing AT&T to upgrade its own infrastructure there sooner than it might have done otherwise. Adjusting our model for the expected difference in uptake rates, we see that an all-fiber network is within range of financial sustainability and FTTN is far off. We would expect that an NBN with FTTN

---

## REVENUE

<table>
<thead>
<tr>
<th></th>
<th>FTTH</th>
<th>FTTH</th>
<th>FTTN</th>
<th>FTTN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross profit per customer per month, after direct costs</td>
<td>$50</td>
<td>$50</td>
<td>$37.50</td>
<td>$37.50</td>
</tr>
<tr>
<td>Profit per year per customer</td>
<td>$600</td>
<td>$600</td>
<td>$450</td>
<td>$450</td>
</tr>
<tr>
<td>Households per km</td>
<td>26</td>
<td>26</td>
<td>26</td>
<td>26</td>
</tr>
<tr>
<td>Profit per year per km</td>
<td>$15,600</td>
<td>$15,600</td>
<td>$11,700</td>
<td>$11,700</td>
</tr>
</tbody>
</table>

## CAPEX

<table>
<thead>
<tr>
<th></th>
<th>FTTH</th>
<th>FTTH</th>
<th>FTTN</th>
<th>FTTN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost per km</td>
<td>$112,000</td>
<td>$112,000</td>
<td>$84,000</td>
<td>$84,000</td>
</tr>
<tr>
<td>Interest rate, annual</td>
<td>7%</td>
<td>8%</td>
<td>7%</td>
<td>8%</td>
</tr>
<tr>
<td>Term, years</td>
<td>15</td>
<td>15</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>Annual payment</td>
<td>$(12,297)</td>
<td>$(13,085)</td>
<td>$(9,223)</td>
<td>$(9,814)</td>
</tr>
<tr>
<td>P/L pro forma per km per year</td>
<td>$3,303</td>
<td>$2,515</td>
<td>$2,477</td>
<td>$1,886</td>
</tr>
</tbody>
</table>

Figure 1: Financial models for FTTH and FTTN with 100% uptake rates
would also be overbuilt by private third parties and that these parties would be more likely to overbuild the most lucrative areas with the best customers.

Figure 2 shows the potential effect. In this scenario (and any scenario even close to it), FTTN is a clear loser and FTTH is roughly at breakeven.

Clearly, supporters of a fiber-rich NBN must pay attention to costs. But FTTN is really out of the running, even without accounting for the actual costs of obtaining access to existing copper and of conditioning (repairing) it to carry high bandwidth. Those costs are not included in the roughly $30 billion estimate for a network that is 20 percent fiber, 7 percent wireless and 73 percent FTTN. But model runs that use any reasonable number for conditioning, even if the cost to gain access to the copper is zero, push FTTN deeper into disadvantage because copper-related costs would have to be amortized over only 5 years or so, maximum, rather than the 15 years assumed.

Economists call these unamortizable costs “stranded.” That is, even if Australia could get by with FTTN/DSL today, either NBN Co or individual customers will have to build last-mile fiber fairly quickly, wasting at least some of the cost of improving the copper. It is not true that building FTTN now and FTTH later costs the same as building FTTH now; it costs more, and some of the FTTN costs will be simply wasted. The real path to FTTH is not in trying to skimp on costs or delay expenditures. It is in realizing revenue potential. Verizon has figured it out. With an average monthly revenue per customer (ARPU) of more than USD$150 (and rising; it was $143 a year ago), Verizon enjoys a gross profit before overhead and marketing costs of at least $50 per customer per month on its FTTH FiOS network. Cable companies using DOCSIS and telephone companies using FTTN scrape by with average monthly revenue of under $100 and profits far below $25 a month.

In Australia, the NBN, by separating the physical network from content providers, should magnify this difference, as it is far easier for retail service providers to develop high-margin services for an all-fiber network than for an FTTN network.

### REVENUE

<table>
<thead>
<tr>
<th></th>
<th>FTTH</th>
<th>FTTH</th>
<th>FTTN</th>
<th>FTTN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross profit per customer per month, after direct costs</td>
<td>$50</td>
<td>$50</td>
<td>$37.50</td>
<td>$37.50</td>
</tr>
<tr>
<td>Profit per year per customer</td>
<td>$600</td>
<td>$600</td>
<td>$450</td>
<td>$450</td>
</tr>
<tr>
<td>Customers/km (80% uptake rate for FTTH, 40% for FTTN)</td>
<td>21</td>
<td>21</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>Profit per year per km</td>
<td>$12,600</td>
<td>$12,600</td>
<td>$4,950</td>
<td>$4,950</td>
</tr>
</tbody>
</table>

### CAPEX

<table>
<thead>
<tr>
<th></th>
<th>FTTH</th>
<th>FTTH</th>
<th>FTTN</th>
<th>FTTN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost per km</td>
<td>$112,000</td>
<td>$112,000</td>
<td>84,000</td>
<td>84,000</td>
</tr>
<tr>
<td>Interest rate, annual</td>
<td>7%</td>
<td>8%</td>
<td>7%</td>
<td>8%</td>
</tr>
<tr>
<td>Term, years</td>
<td>15</td>
<td>15</td>
<td>15</td>
<td>15</td>
</tr>
<tr>
<td>Annual payment</td>
<td>$(12,297)</td>
<td>$(13,085)</td>
<td>$(9,223)</td>
<td>$(9,814)</td>
</tr>
</tbody>
</table>

| P/L pro forma per km per year | $303 | $(485) | $(4,273) | $(4,864) |

Figure 2: Financial models for FTTH and FTTN with differential uptake rates

Connecting classrooms. Students can access remote resources and instructors online from their schools and from their homes. Small, remote schools can be connected to the world, thus reducing the gap between urban and rural learning. In this picture, schoolchildren in San Carlos, Calif., participate in a virtual field trip to a museum in Denver, about 1,500 kilometers away.
Fiber Sweeps Across the Globe

Completing the Evolution of the Fiber Infrastructure

Across the globe, fiber is now reaching the access infrastructure, feeding bandwidth-starved homes, communities and countries the digital fuel they need for a new era.

Fiber is connecting the whole world. Beginning with undersea, intercontinental fiber cables and extending to terrestrial networks, fiber reaches closer and closer to users over the years.

Today, with bandwidth needs growing relentlessly, there is a massive copper bottleneck in the access or last-mile network.

Homes and businesses on the other side of the bottleneck have computers with chips that can process vastly more bandwidth than is capable of reaching them.

What’s needed to break the bottleneck is more fiber, which can carry unlimited information.

Scarcity of bandwidth anywhere is a deterrent to progress and innovation.

Like electricity, computing power and storage capacity, bandwidth has become a key resource, driving entrepreneurship, innovation and breakthroughs in science, medicine and other fields.
Fiber Sweeps Across the Globe
Completing the Evolution of the Fiber Infrastructure

Across the globe, fiber is now reaching the access infrastructure, feeding bandwidth-starved homes, businesses, institutions, communities and countries the digital fuel they need for a new era.

Terrestrial, interexchange and metro telecom fiber carry 3 – 10 Gbps per wavelength.

The copper bottleneck: Fiber to the neighborhood with DSL relies on copper in the last mile, leaving homes and businesses with extensive computing power starved for bandwidth.

FTTH will change lives. Distance will disappear. Families will visit faraway places and friends from their homes. Health care will be revolutionized. Rather than “having to see a doctor to learn whether you need to see a doctor” a world of medical expertise and services will be available to the home. Telecommuting and home-based businesses will be able to flourish and small companies will find themselves able to compete with vendors around the world. Only FTTH can deliver all the benefits.

Fiber to the Farm. Fiber will help enable an agricultural revolution, serving the myriad needs of farmers and bolstered where needed by wireless and satellite
Q: What is bandwidth?
A: In a network, bandwidth (what engineers call bitrate) is the ability to carry information. The more bandwidth a network has, the more information it can carry in a given amount of time. Networks with high bandwidth also tend to be more reliable because fewer bottlenecks disturb the flow of information.

Q: How much bandwidth – or information delivered by bandwidth – do we need?
A: The amount of bandwidth we need grows every year. Worldwide bandwidth use roughly doubles every two years. The biggest growth has been for video – traditional pay TV, “over the top” or Internet-based video, and video communications. This trend is expected to continue; Cisco estimates that by 2017, consumer Internet video traffic will account for 69 percent of all consumer Internet traffic, up from 57 percent in 2012.

Video requires not only extra bandwidth but also extra reliability. The smallest delay in data transmission can result in distorted views. More video is available than ever before, and people are watching video on more screens at once. In addition, video formats are becoming more bandwidth-intensive. HDTV can require 8 megabits per second (Mbps) or even more for fast action such as in sporting events, even with new MPEG-4 compression technology. So-called 3D immersive HDTV – already used in some academic and industrial settings for telepresence – requires between 50 Mbps and 300 Mbps, and 4K video, which has four times the pixels of today’s best-quality HDTV broadcasts, requires 16 to 32 Mbps, depending on how fast the screen action is and how much of the screen is taken up by fast-moving objects.

Q: What about other kinds of data?
A: Bandwidth requirements for many kinds of data are exploding. For example, new digital cameras can create larger and larger images; 30 megabytes is not uncommon. Amateur HD video cameras use about 10 gigabytes per hour of video – the equivalent of 300 of those 30 MB still images. In health care, the medical images produced by equipment such as CT scanners are a hundred times larger than camera images, and more. In the last few years, business and science both entered the era of “Big Data” applications that collect and analyze data on massive scales. Today’s Big Data applications range from consumer pricing models to DNA sequencing to particle physics to control of electrical grids. Big Data doesn’t work without Big Bandwidth. A DNA sequencer produces enough data to monopolize a 2.5 Gbps connection.

Q: Can’t copper carry high bandwidth?
A: Copper’s capacity is far less than fiber’s. It can support high bandwidth for only a few hundred meters. The longer a signal travels on copper, the lower the bandwidth. Optical fiber is unique in that it can carry high-bandwidth signals over enormous distances. Fiber uses laser light to carry signals. Under some circumstances, a signal can travel 60 kilometers without degrading enough to keep it from being received. The international minimum standard is 20 kilometers. Fiber is also far better able to support upstream bandwidth – that is, from a user out to the network. High upstream bandwidth is important for video communication and for many business applications such as disaster recovery and cloud computing. Business (and many consumer) uses also require the added reliability of fiber.

Q: What’s the difference between upstream and downstream bandwidth, and why is it important?
A: In the debate about FTTH versus fiber to the node, both sides tend to argue in terms of downstream bandwidth, because most users need more downstream bandwidth than upstream – especially for bringing video entertainment into the home. But emerging consumer uses such as home video uploads, computer games, distance learning, telepresence, and telemedicine require as much upstream bandwidth as downstream. Small businesses, often home-based, may need upstream bandwidth as well. Imagine a wedding photographer sending proofs by email to clients! Larger businesses may wish to copy all their working data files for safekeeping to a remote computer center.

Fiber and Bandwidth

The bandwidth of an FTTN (DSL) signal declines with distance from the fiber node. VDSL2, the most advanced form of DSL, can deliver about 30 Mbps at 1 km, depending on the quality of the copper. A new technology called vectoring increases VDSL2 bandwidth at short distances if the copper is in good condition. Vectoring gives retail service providers less control and therefore less ability to differentiate their services.
**Q:** What about wireless? I hear 4G wireless can provide 54 Mbps.

**A:** That’s the potential bandwidth shared by all users connected to a cellular antenna. Wireless broadband depends on fiber to move information to and from cell towers. And even so, each antenna can support only a finite number of cellular signals. Cellular data traffic grew 200-fold from 2006 to 2012 and will grow another eightfold by 2016. Providers are now severely limiting wireless data and are encouraging or forcing customers to use Wi-Fi connections instead of cellular networks for data. Those Wi-Fi connections, in turn, work best when they can quickly offload data to a fiber network. In Australia, the typical carrier-imposed limit on cellular connections is 15 gigabytes per month, or about half a gigabyte per day. Use your phone to view video a few times a day, and you run over the limit.

**Q:** What exactly makes fiber “future proof”?

**A:** The equipment used to send light signals over glass fiber keeps getting better. So equipping an existing fiber network with new electronics and with lasers that pulse light faster, or lasers that use different wavelengths of light, can vastly increase available bandwidth without changing the fiber itself. New electronics are very cheap compared with the original cost of laying the fiber. At the customer end, the system can be designed so that customers themselves can simply pull the old unit out and plug the new one in. Therefore, once fiber has been deployed, network operators can keep increasing bandwidth as needed at very little cost.

**Q:** How long has fiber optic technology been in use?

**A:** Fiber optic cable is the foundation of the world’s telecommunications system. It has been used for more than 30 years to carry communications traffic from city to city and from country to country. Almost every country has some fiber optic cable, delivering services reliably and inexpensively. The first time fiber delivered a signal directly to a home (in Hunter’s Creek, Fla., in the United States) was more than 25 years ago. Today, more than 200 million homes worldwide have fiber connections available, and about 100 million homes are connected to fiber.

**Q:** All providers seem to claim they have fiber networks. What’s different about fiber to the home?

**A:** Don’t be fooled! It is true that most cable and FTTN (DSL) networks use some fiber. In these networks, the fiber carries the signal close enough to homes so that copper can carry it the rest of the way.
Innovative technology startups are flocking to “gigabit cities” such as Kansas City and Chattanooga in the U.S.

way. However, this approach requires expensive, difficult-to-maintain electronics at the point where fiber meets copper. (These electronic devices, called DSLAMs, use a great deal of power and are quite sensitive to lightning strikes. Even the cost of bringing electric power to them can be huge, depending on where they are located.) The available bandwidth is far less than an all-fiber network. And most of these halfway approaches do not allow symmetrical bandwidth – cable and DSL systems generally can’t upload information as fast as they can download it.

Q: Isn’t a network with some fiber good enough?
A: It’s not good enough to support a tech-savvy home-based business. Today’s cable modems and FTTN may suffice for consumers to send emails, download songs or share family photos. If you want to log on to the corporate LAN from home and work effectively, you’ll need more. And what about uploading a high-def video of your child’s football match, or sitting down to dinner virtually with family members a thousand kilometers away?

Q: Why does it matter how close to the home fiber comes in DSL and cable systems?
A: With copper cable, bandwidth drops precipitously with distance. For example, the latest commercial versions of DSL can carry a signal of more than 150 Mbps for about 220 meters. Over a kilometer, today’s DSL can deliver only about 30 Mbps. In practice, the real bandwidth is less. As often happens with fading technologies, a huge effort is being made to squeeze as much as possible out of past investments in copper. The most recent expedient, vectored DSL, allows 50 Mbps downstream signals for as far as 600 meters under ideal conditions. It won’t work on very old copper wiring, its upstream bandwidth is limited and it requires expensive electronics. However, it is touted as an interim solution for network builders that cannot afford FTTH. In the next few years, a new technology, G.fast, will become available; under ideal conditions and with vectoring (crosstalk cancellation), G.fast is expected to provide 500 Mbps symmetrical bandwidth up to 100 meters from the node. G.fast may prove to be an excellent solution for retrofitting apartment buildings with fiber to the basement (as long as those buildings have good internal wiring), but it requires bringing fiber very close to customer premises – thus eliminating much of FTTN’s cost savings – and it is still limited in comparison with true fiber to the home.

Q: With cable and DSL, there’s often a gap between advertised and actual bandwidth. Is that true for fiber?
A: No. Cable, DSL and even wireless networks are usually heavily oversubscribed – that is, providers promise users more than the total amount of available bandwidth because they know all users aren’t going full throttle most of the time. As a result, networks slow down during periods of heavy use, such as when teenagers come home from school. Copper networks are also more subject to speed degradation due to the condition of the wiring. Fiber has enough bandwidth and reliability that providers can guarantee high speeds with little or no oversubscription. If a fiber network is designed properly, users will always get the speeds that are advertised – or better. Data published by the U.S. Federal Communications Commission in February 2013 showed that, on average, fiber-to-the-home services in the U.S. delivered 115 percent of their advertised speeds.

Q: Is FTTH technology expensive?
A: In new construction, fiber costs about the same as copper to build, and it costs much less to operate and maintain. Building fiber to the home is expensive only when compared with not building a new network – that is, with making minor tweaks to an existing copper network. The problem is that these less-expensive solutions don’t meet users’ needs. In the last few years, the flood of video content has outrun the ability of older copper technologies to handle bandwidth demands. In many parts of the world, providers shut off or slow down service or impose prohibitive fees for customers who exceed monthly bandwidth caps. Customers don’t like these restrictions, and they don’t appreciate being called “bandwidth hogs” for using services they have paid for. In addition, it’s not clear that providers save money by failing to meet users’ needs, because limiting bandwidth means limiting revenue potential as well.

Q: How does fiber’s bandwidth encourage economic development?
A: In several ways. Businesses can be more efficient and effective with fiber connections, so fiber-connected businesses are more likely to grow and thrive. When businesses grow large enough to move or expand to a new location, they look for locations with great, reliable bandwidth – often leaving behind their former, less-well-connected locations. In addition, some technology businesses are building products that require very high bandwidth to use, and these firms must be fiber-connected to even develop and test their products. (That’s why innovative tech startups are flocking to “gigabit cities” such as Kansas City and Chattanooga in the U.S.) Finally, FTTH and the applications it enables appeal to consumers – and businesses prefer to locate where they can easily attract employees.

Broadband Communities Magazine has reported on many such cases, as well as on surveys of businesses and economic development officials that confirm the anecdotal evidence. In the last few years, large-scale statistical research has established that broadband boosts economic growth and that the effect increases with bandwidth. For more information about fiber and economic development, see www.ftthcentral.com.
How Fiber Could Enable The Agricultural Revolution

Farmers need more connectivity than urban dwellers, not less. They need fiber.

Though bringing fiber to rural areas is expensive, its benefits can be truly enormous. A communications revolution is taking place in agriculture today, and if Australian farmers and graziers are to fully benefit from it, they need massive bandwidth to the fields. They don’t have it today, and they’re not slated to get it under any version of the NBN.

No doubt policymakers were concerned about costs when they decided to provide the most rural 7 percent of Australian households with satellite and fixed wireless hookups, but the solution will be a short-term one, we suspect. As in the United States, urban dwellers have little idea of how sophisticated farming always has been and how much more sophisticated it is becoming.

Worldwide, farmers have used advanced communications technologies since the 1970s. Today, even farmers in Africa and India get crop price quotes directly transmitted to their mobile phones.

In Australia, a new CSIRO report calls on farmers to increase yields, cut costs and maximize profits by monitoring everything from oyster heartbeats to soil moisture. Yields per liter of water can double if farmers can avoid watering areas that don’t need watering that day. Likewise, fertilizer can be applied in varying amounts and only where it will do the most good.

Sense-T, a partnership of the University of Tasmania, the Tasmanian Government, CSIRO and IBM, combines real-time sensor data that can be read on cellphone and tablet apps. One Tasmanian vineyard operator attached sensors to his vines to detect botrytis – a fungus that is great for grapes destined to become dessert wines but that can ruin other grapes.

The electronically tagged cows of UNE’s Kirby SMART farm, whose locations can be tracked on a phone or tablet, have captured the public’s imagination. Not as cute, but equally useful, are the farm’s 100 soil sensors, which transmit data on moisture, air and ground temperature every five minutes. New companies, such as Agriwebb, are developing sophisticated mobile farm and livestock management software.

Farm equipment vendor John Deere sells its FarmSight system – which includes moisture sensors, farm machines that transmit their maintenance status and operational availability, and tractors that patrol fields without human intervention – in Australia and around the world. In many places, the system can combine this on-the-field data with aerial or satellite views of crop growth and fertilizer need.

Fiber can help with marketing, too – some graziers install cameras in the field to assure potential buyers about the way they raise their animals.

A recent Tasmanian Farmers and Graziers Association survey suggests that more than one-third of its members use mobile tablet technology to access the Internet. But nearly 70 per cent of respondents to a 2011 NSW Farmers’ survey indicated their mobile connections were inadequate for email or Internet use on their farms.

Farmers have other needs as well: Children’s education, family entertainment and home businesses that range from video editing to selling woolen goods and bottled preserves.

Current plans don’t take their needs into account. NBN brings a satellite feed to the farmhouse, but installing the wireless network that must cover most farms is the farmer’s responsibility. Cell towers typically remain where they were – and those towers rarely cover all the places they should on their farm.

As the years pass, those cell towers will increasingly be served by fiber to save maintenance costs and improve bandwidth and reliability. At that time, Australia should take a closer look not only at the decreasing cost of serving rural households, but also at the cost of not serving them – fallow farms, populations that stress expensive urban infrastructure, children schooled away from their parents, aging rural populations deprived of medical care.

Fiber to the farm enables precision agriculture, which conserves costly resources such as water and fertilizer.
Q: Do you know of any truly open-access large FTTN network? Is FTTN practical for retail service providers?
A: Open networks and innovative services will not happen unless you have full structural separation [where one company owns the communications infrastructure and other companies deliver services], as is happening in Australia. FTTN in a truly structural separation model could work, but it doesn’t make a lot of business sense anymore. To see some of the pitfalls, look at New Zealand, where there is FTTN and there is also structural separation. The structurally separated infrastructure company Chorus went back to the government and said, “we need to have more regulatory protection.” [Editor’s note: New Zealand is currently upgrading its network to FTTH.]

Q: You’ve mentioned that FTTN could be used in some areas as a transition to FTTH. Could you expand on this?
A: This makes sense only in specific situations. On good copper, most Australians now already have 20 Mbps – so how big is the need for that FTTN step in between? The argument against a mixed FTTN/FTTH network from NBN Co has been that a splintering approach to infrastructure can potentially undermine the overall network integrity and reliability. But now the best NBN argument is that FTTN is not likely to save money anyway, so why bother?

It is important to note that for vertically integrated telco business models such as Deutsche Telekom in Germany or AT&T in the United States, FTTN as an intermediate step to FTTH can make sense. So I am not against this. But in the case of Australia, where we decided it is good policy to create an open network and to separate the operation of the network from the content on the network, such an intermediate step doesn’t make sense.

Q: Australia obviously has a shortage of fiber splicers and craftspeople with other fiber-related construction skills. Would there also be a shortage of copper technicians to make copper DSL loops ready for FTTN?
A: Most certainly, yes. With 50,000 or 70,000 FTTN street cabinets to install, you would need many more technicians. Industry consensus is that, given the advanced FTTH deployment situation Australia is now in, deploying FTTN doesn’t make sense anymore. The feedback I get from engineers is that there is no longer a cost advantage in deploying FTTN, either. My guess is that there might be some intermediate FTTN deployment, but nowhere near what the Coalition’s original plan was, with only 20 percent of households getting fiber.

Q: Australia set out to build a network that would last 50 years – which we believe is the right approach. But is it worthwhile to consider design tradeoffs that might reduce capital expenditure while still meeting the expected growth in bandwidth demand? For example, could the NBN box at customers’ homes have a single port instead of six?
A: This is one of the elements of the NBN that might need reconsideration. The original thought was that this would allow content providers, totally independent from each other, to deliver parallel services. Some providers could be telecoms, others e-health, smart grids, and so forth. If this independence can be done through software on a single, less expensive and more world-standard port, so much the better. The critical thing here is not to make telcos and other ISPs the gatekeepers of all of these different services.

Q: Will the NBN box allow smart grid, emergency communications and other networks to all ride together?
A: The current NBN box at the customer’s end allows for each of these utilities to have a direct link with their customers independent of anybody else. The last thing that you want is that each of these different organizations come with their own box and drill through the walls to get into the premises. But again, with new technologies and new ideas we can revisit this, with the overriding element that there should not be any gatekeepers.

For example, if you need medical monitoring services, a health care organization should be able to come in and link its medical equipment directly to the NBN, independent of a telco or of ISPs. The health care facility might be totally free of charge and paid for through the insurance system, so it needs to be totally separate. Also, electricity companies will want to have end-to-end control over their networks and will want a totally independent access facility to the network.
customer. Whatever is the most cost-effective solution within these parameters is the solution we should use.

**Q:** Another possible design change that’s been mentioned is going back to a smaller number of hubs – the number was originally 14 and was then increased to 121.

**A:** If you have only 14 hubs, it becomes far more cost-efficient for outsiders to use the NBN. If they need to go to 121, that cost picture becomes totally different, and most of these organizations will now be forced to use the telcos to distribute their services.

The Australian regulator ACCC slipped up big time here by allowing this to happen. It took a narrow telco approach rather than a broader national infrastructure approach. Its counterargument is that competition in the backhaul will prevent the few telcos that are going to build their ICT infrastructure on top of the 121 hubs from misusing this dominance. I am not convinced about that. However, the ACCC has also indicated that it is ready to step in if indeed the telcos misuse this situation.

**Q:** A third possibility that’s been suggested is to bring fiber to the basement – rather than to every unit – in some apartment buildings. Verizon does this in buildings that have good internal copper wiring and are difficult to rewire with fiber.

**A:** It is on my list of issues that require a review based on better insights, common sense, new developments, innovations and so forth. In general – not just on this issue – we need to realize that NBN Co is another monopoly, although a benign one. We do need to make sure NBN remains flexible, mean, lean and innovative.

A similar review is needed for greenfield deployments (new construction). There, too, we could have more competition to speed the NBN rollout.

**Q:** What were your priorities for the NBN, and what are they now?

**A:** The first priority was to get as many households as possible connected and taking services. From a business strategy point of view, the single most important issue to get user penetration is affordability, not technology. If you don’t have a low entry price, people will buy it only sparsely. Unfortunately, under the current NBN Co narrow telco-centered business model, this means that in order to “provide the low-price entry-level option” they priced a 1 Gbps service beyond the affordability of most users, simply to generate premium telco revenues. Yet the real social and economic advantage of FTTH is to give everybody a gig.

Now, I see that typically as a problem for later. If necessary, a political or regulatory decision can change that with the stroke of the pen. Also, arguments of what the wholesale and retail costs will be in 10, 20 or 30 years’ time are, in my opinion, rather less relevant. They can be changed when it really becomes an issue. On the other hand, technology can’t be changed that easily, so we need to get that right first time.

With the NBN now politically secured and with bipartisan support, after the elections we can sit down and look at all of these issues and in a politically more relaxed way start fine-tuning the NBN.

So, by all means do the review and a proper audit and fine-tune the NBN policy, but the vision and the overall policies and strategies are the right ones and you shouldn’t start unraveling them.

I also hope that whoever wins the election fixes the policy abnormality that on the one hand we are building a national infrastructure utility for health care, education, business, smart grids and so on, but on the other hand, the business model for it is based on totally out-of-date telco pricing mechanisms. This simply doesn’t make sense, and if that is not fixed it will remain a financial sore for many years, as it requires NBN Co to deliver a telco profit and basically ignore all the other social and economic benefits that don’t show up on its balance sheet.

---

**RELIABILITY**

Even the simplest home-care devices such as this emergency pendant are useless without reliable and ubiquitous connectivity. The Virginian, a senior-living facility near Washington, D.C., upgraded its internal network to all-fiber so it could reliably manage dozens of wireless access points to connect monitoring equipment from Healthsense.
Rise to the Gigabit Cities Challenge

Entrepreneurs are choosing Gigabit Cities to launch business ventures. Young, creative individuals are moving to cities with advanced fiber networks. Capture the advantages these networks can bring to your community.

Choose a Successful Partnership Model

Your city can plan for, monetize, and manage a fiber-based broadband investment. Innovative and creative public-private partnerships centered around economic vitality are sparking interest nationwide. Come to Chicago and find the strategies that can work in your community.

Use Broadband to Create Jobs And Attract Industry

Find out how to help local businesses grow and attract new businesses – all by leveraging advanced broadband.