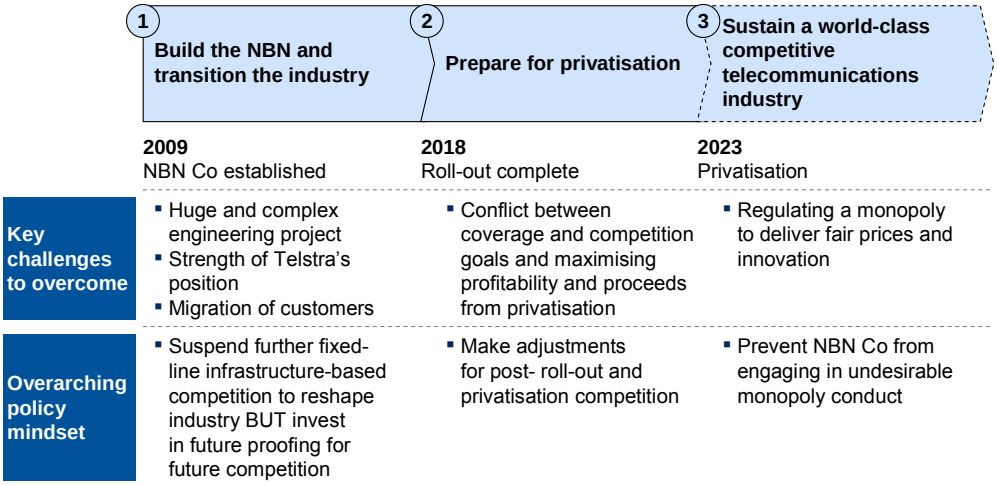
C Ensuring a competitive telecommunications industry

Superfast broadband infrastructure has the potential to enable a new generation of services. Some of these we know, some we can imagine and some we are yet to discover. Government must ensure that the NBN's design, regulatory framework and impact on the broader telecommunications market structure support the development and widespread adoption of innovative services.

Although the underlying infrastructure of the NBN provides the technical capabilities to power this transformation, enabling competition and a healthy market structure are critical to delivering long-term outcomes. Government has a significant role to play in ensuring that the new industry evolves into a sustainable and dynamic structure in which service providers compete to drive long-term innovation, technological progress and cost efficiencies.

Across the different phases of implementing the NBN, the key challenges faced will change, reflecting the growth of the network and the evolution of market structure. Policy mindsets will have to adapt in response (Exhibit C–1).

Exhibit C–1. NBN challenges and proposed policy mindset over development phases



SOURCE: Implementation Study

It is only natural that in the short-term the emphasis be on how to build the network and transition the industry (the first phase). The NBN is a huge and complex engineering project, which will be challenging to implement operationally at a national scale, and under pressure to generate a revenue stream by activating customers as soon as possible. It is also important during this initial phase to ensure that the framework of pricing regulation is consistent with Government's objective of providing affordable superfast broadband services to all Australians.

Even at the early stages of establishing the NBN however, Government's policy framework must anticipate the market structure and competition outcomes that it seeks to achieve in the longer term (Phases 2 and 3). In particular, Government needs to prevent NBN Co from making decisions that may facilitate network deployment in the short-term but ultimately frustrate Government's long-term policy objectives.

Part C consists of two chapters:

- Chapter 9 sets out the risks to creating a vibrant NBN-enabled market and delivering on Government's competition policy objectives in the long-run
- Chapter 10 proposes a suite of measures to mitigate these risks and deliver the desired competition outcomes.

9 Understanding adverse competition scenarios

SUMMARY

- The innovation path for services and business models enabled by new, long-lifespan technologies is uncertain. Decisions made today around implementing the NBN need to anticipate a range of possible innovation paths and should support the development of a vibrant market along any of these paths in the long run.
- NBN Co's open-access, wholesale-only status is not sufficient to preclude the development of adverse competition scenarios. Concentration of ownership in backhaul and/or content can stifle market dynamics. Fierce competition with limited investments in infrastructure can stifle innovation.
- Allowing the NBN fibre infrastructure to achieve monopoly status across most of the fibre footprint is desirable at the passive layer over the long term for reasons of investment efficiency, provided it is capable of supporting sufficient active-layer competition.
- Allowing monopoly status to extend into the active layer is also acceptable in the short-term to ensure a level playing field for retail providers, and to give NBN Co flexibility on service pricing. However, this presents longer-term risks of adverse monopoly conduct by NBN Co that must be guarded against.

Enhancing competition is one of the objectives of the NBN initiative. It is the rationale for NBN Co's open-access, wholesale-only model. The NBN is intended to foster a healthy service provider market by providing equivalent access to world-class broadband infrastructure. While this approach resolves the issue of equivalence at the retail level, adverse competition outcomes may still develop over the long asset lifespan of the passive fibre infrastructure.

This chapter lays out the risks to creating a vibrant NBN-enabled market and delivering on Government's long-run competition policy objectives. It is organised in five sections:

9.1 Acknowledging uncertainty in the evolution of broadband markets

9.2 Recognising future retail market structure challenges

9.3 Ensuring scope for competitive investment in service innovation

9.4 Anticipating potential adverse monopoly conduct by NBN Co

9.5 Learning from international experience.

9.1 Acknowledging uncertainty in the evolution of broadband markets

The NBN initiative constitutes a significant national investment and the lifetime of the passive infrastructure will be very long. It is important, therefore, that the project be designed not just with the next decade in mind but with a view to the long-term future of Australian telecommunications.

This section explains the need to recognise the uncertainty in the future evolution of telecommunications and allow for flexibility to respond to changes in technology and competitive dynamics. Two subsections follow:

9.1.1 Factoring in the pace of change in technology and applications

9.1.2 Imagining different futures with many possible business models.

9.1.1 FACTORING IN THE PACE OF CHANGE IN TECHNOLOGY AND APPLICATIONS

Constant change is a cornerstone of telecommunications. Innovation in technology and applications is fast-paced and quickly diffused into society, transforming the way we live and work. Consider the music industry's shift to online distribution platforms. Although the iPod was introduced less than a decade ago, digital distribution is now the focus of the industry, with iTunes accounting for 25 percent of industry revenues[204] and still growing strongly within a declining industry revenue pool.[205]

Innovation enables market entrants to adopt new business models that translate into new products and services for end users. Some of the most influential companies today are based on Internet services like search engines, and have started to innovate in areas previously the domain of incumbent telecommunications companies. For example, Skype now offers voice-over-IP services which have the potential to displace carriers' voice revenues. This is a recent and rapid development; Skype was founded less than a decade ago, whereas Telstra has provided voice services for over a century.

The direction of this innovation is difficult to predict. When long-lifespan infrastructures have been rolled out in the past, the full extent of the innovation they would unleash has never been accurately predicted. The copper network originally deployed for voice communications and the coaxial network originally deployed for TV broadcasting are

[204] Huges, N 2009, 'iTunes a quarter of music sales; Apple a third of Wi-Fi use', *AppleInsider*, 18 August, viewed 16 February <http://www.appleinsider.com/articles/09/08/18/itunes_a_quarter_of_music_sales_apple_a_third_of_wi_fi_use.html>

[205] Pfanner, E 2010, 'Music Industry Counts the Cost of Piracy', *International Herald Tribune*, 21 January

now used for IP-based communications between machines not envisaged during their original planning.

Similarly, the full extent of the innovation potential created by NBN's fibre infrastructure cannot be predicted today. All we know is that innovation will take place rapidly, and its impact is likely to be dramatic. It is critical to factor this uncertainty into today's decisions, despite the time-pressure to start providing services and capturing the benefits of the NBN.

Underestimating uncertainty could lead to decisions that may facilitate network deployment, but which ultimately prove short-sighted in constraining the full potential of the new infrastructure. Accounting for uncertainty in the policy framework is the only way to mitigate the risk.

Highlight. The pace of change in technology is rapid and accelerating, making it difficult to predict the innovation path for services and business models enabled by new long-lifespan broadband infrastructure. The decisions surrounding the deployment of the NBN need to account for this uncertainty to avoid constraining future innovation and market evolution.

9.1.2 IMAGINING DIFFERENT FUTURES WITH MANY POSSIBLE BUSINESS MODELS

New broadband services can result from developments at the network, the device, and the applications level, as illustrated in Exhibit 9–1 for premium video content delivery. These three different innovation paths both compete and coexist—different services exploit different paths, and some sophisticated service offers exploit all three simultaneously.

Network-based innovation path

New services may result from developments at the active layer of the network. A clear, recent example of this innovation is the use of ADSL transmission of data through the non-voice spectrum on copper telephone lines, requiring direct physical access to the copper. In countries where the copper was not open-access, many incumbents resisted the implementation of ADSL due to concerns that VoIP would cannibalise their PSTN revenues.

Exhibit 9–1. Different innovation paths deliver premium video content today

Innovation path	Service category	Example
Network-based	IPTV	Telstra T-Box, TPG TV
Device-based	Smart set-top box	Apple TV, Foxtel iQ
Applications-based	Video portal	Hulu, YouTube

Source: Implementation Study

Similar possibilities exist on optical fibre. Just as data transmission over copper uses electromagnetic spectrum, so too is the case for fibre. This can be used in a variety of innovative ways. For example, many carriers today use different wavelengths in the access network for carrying data, television signals and, in some cases, voice. In the future, the flows of light could be manipulated in different ways to meet different user requirements—for example, the use of quantum states for cryptography, which has already been demonstrated at scale.[206]

This innovation path is driven and controlled by the active network operator. A retailer seeking to deploy new services requiring new active network capabilities must either persuade the current active layer operator to implement these new capabilities on their active equipment, or else gain access to dark fibre on which the retailer can add its own, enhanced active equipment. Seen from a different perspective, this means that a wholesaler holding a monopoly over the active layer of the network has the power either to block or to enable innovation that requires upgrades to active equipment. Active-layer competition, enabled by either wavelength unbundling or physical unbundling, may be necessary to resolve this issue (Chapter 10).

Device-based innovation path

Devices can also enable new services using an existing network. In this case, the service is network-independent, and is enabled and controlled by the industry participant offering the devices and managing the necessary platform.

An example of this path is network gaming on consoles—for example, the Xbox, where Microsoft's servers connect multiple providers together around the world, using a variety of network types to complete the connections. A recent example in the communications space is the Nexus One smartphone from Google, which can be used on many networks and provides a full range of services and applications.

Applications-based innovation path

Finally, applications can be deployed that use existing networks and devices. This has been the prevailing mode of innovation to date in the Internet age, as web-based services have grown at unprecedented rates, the most recent spectacular example being Facebook, which acquired over 100 million users in its first 5 years of operation.[207] Consumers equipped with standardised devices and Internet connections are able to access a wide range of services.

206 Pease, R 2008, 'Unbreakable' encryption unveiled', *BBC News*, 9 October 2008, viewed 16 February 2010, <http://news.bbc.co.uk/2/hi/science/nature/7661311.stm>

207 Facebook 2010, *Company Timeline*, viewed 16 February 2010 <http://www.facebook.com/press/info.php?timeline>

This mode of innovation is compelling as it allows new services to be deployed with minimal investment: potential users have already purchased the necessary hardware (and, in some cases, software), and the application can be delivered almost instantly over a broadband connection. This method of distribution is ubiquitous for static media content, asynchronous communications (such as email), and e-commerce platforms (for example, eBay). However, it does reach limitations of standard hardware and connections for applications such as voice (where quality of service is essential) and rich media delivery (for example, IPTV).

Preparing for multiple innovation paths

Predicting which of these paths will dominate is very challenging, as demonstrated by numerous examples of inaccurate expert predictions made over the life of the computing sector. There are myriad scenarios for the market structure and business models that could emerge throughout the lifetime of the fibre infrastructure. The Government must ensure that its substantial investment does not presuppose a specific outcome and foreclose alternate scenarios.

> *There is no reason anyone would want a computer in their home*
>
> Ken Olsen, founder of mainframe-producer DEC, 1977.[208]

Over the history of communications technology, the dominant mode of innovation has shifted several times. In the 1960s and 1970s, the advances in telecommunications were predominantly in the core, with the advent of digital switching and fibre backbones. The 1980s saw the advent of faxes and faster modems; devices which unlocked new modes of communication within the limitations of a voice-optimised network. Since the 1990s, applications have flourished as the Internet and mass computing have enabled global entrepreneurship.

Many commentators believe that the future lies in devices and applications acting in concert, with a 'dumb IP' pipe providing the linkages between these. This is certainly plausible. However, networks could continue to play a critical part in future services. There are efforts in progress at several universities which consider a world beyond today's unmanaged Internet.[209] Issues such as net neutrality, investment incentives and traffic volumes are emerging, as the current 'best efforts' architecture becomes increasingly central to billions of lives around the globe. There is no consensus on how the global network should, or will, evolve.

A new network such as the NBN should anticipate multiple paths of industry evolution. Industry consultation, debate, and public scrutiny should continue as the initial

[208] Crovitz, G 2009, 'Technology predictions are mostly bunk', *Wall Street Journal*

[209] For example, Stanford University's Clean Slate interdisciplinary research program <http://cleanslate.stanford.edu>

specifications for NBN services are developed. If poorly defined, these specifications could limit or bias the innovation paths through which new applications are developed, favouring some providers or business models and distorting healthy market competition. There is also a risk of diverging from global standards.

Highlight. Innovations enabled by NBN could develop along different paths that result in different business models for the market participants in the future. Choices today that limit the range or bias the possible development of broadband models can distort the natural evolution of a healthy competitive market, preventing innovation throughout the life of the infrastructure.

9.2 Recognising future retail market structure challenges

Even with the requirement that NBN Co operates on an open-access, wholesale-only model, future adverse competition scenarios can still unfold if additional measures are not implemented. The following five subsections explain what those scenarios are and how they can develop:

9.2.1 Recognising that backhaul concentration could stifle competition

9.2.2 Recognising the importance of interconnection arrangements

9.2.3 Contemplating the possible failure of Layer 3 markets

9.2.4 Recognising the potential impact of content concentration

9.2.5 Recognising the risk of retail margin erosion limiting innovation.

9.2.1 RECOGNISING THAT BACKHAUL CONCENTRATION COULD STIFLE COMPETITION

As we discuss in Chapter 6, backhaul is a key network element to support retail products. A controlling position in backhaul markets may result in a controlling position over all NBN-enabled services in the regions served by that backhaul. Given the significant numbers of monopoly links in regional areas today, creating an affordable transit backhaul network will be critical to ensuring nationwide competition.

However, backhaul-related risks to healthy retail competition remain even once affordable, open-access backhaul is available. As we discuss in Chapter 6, if Telstra is granted access to connect below NBN Co's POIs using its own backhaul network, it will gain a cost advantage over other retailers. Hence the Implementation Study recommends that such access not be permitted. There are also many duopoly links, where NBN Co will not initially deploy backhaul, and there is risk of uncompetitive pricing in these areas—particularly given the vertically integrated business models of the two largest backhaul operators. As noted in Chapter 10, the Government should ensure that the backhaul market is monitored to ensure availability of affordable backhaul to NBN customers—for example, by permitting NBN Co to provide additional backhaul links in the future.

9.2.2 RECOGNISING THE IMPORTANCE OF INTERCONNECTION ARRANGEMENTS

Currently, ISPs seeking to connect their customers to other networks must employ a combination of peering and transit arrangements. Today, Australia has a bifurcated peering landscape, where four large service providers peer with each other, and the remaining providers peer mainly through multi-lateral peering (MLPA) at Internet Exchange (IX) fabrics (WAIX in Perth, for example). However, the scale of the major providers necessitates the purchase of significant transit capacity by smaller operators.

Transit capacity is a significant cost driver for ISPs. While prices continue to decline (currently suggested to be below $200 per Mbps depending on the purchasing scale[210]) this is offset by the steep upwards trend of customer consumption patterns and pressure on ISPs to provide increasingly generous download quotas. It has been highlighted as a barrier to providing affordable, high bandwidth services. The implications of these costs vary depending on the business model in question. For retail service providers, they raise the cost of Internet traffic. For content or application providers, they increase the economic hurdles to reaching end-users. The NBN will impact each of these providers in different ways.

Content providers should have more options to create high-bandwidth links with end users under the NBN construct. The NBN Co's Layer 2 offering should enable Layer 3 wholesale providers to offer direct-to-end-user connectivity, and the multi-operator home environment will allow wholesale providers to deliver content to the premises without being the primary phone and Internet carrier. For the delivery of rich, premium content and services to end-users, this environment should be better-suited than today's commercial landscape.

While Internet service providers will also benefit from these greater opportunities to tailor their customer-facing connections, it will still be their responsibility to secure connections to other providers and to the global Internet. Given the recommendation that the NBN not participate at Layer 3, there is no practical mechanism for NBN Co to intervene in the current peering and transit market beyond the provision of affordable Layer 2 transit backhaul services on currently uncompetitive links.

Nonetheless, the Implementation Study believes this limited intervention is appropriate, as the peering environment has been strengthening locally, and international transit pricing is falling steadily. In addition, NBN Co's intervention in the transit backhaul market is likely to drive further third party investment in the Layer 3 market.

210 Stakeholder interviews

9.2.3 CONTEMPLATING THE POSSIBLE FAILURE OF LAYER 3 MARKETS

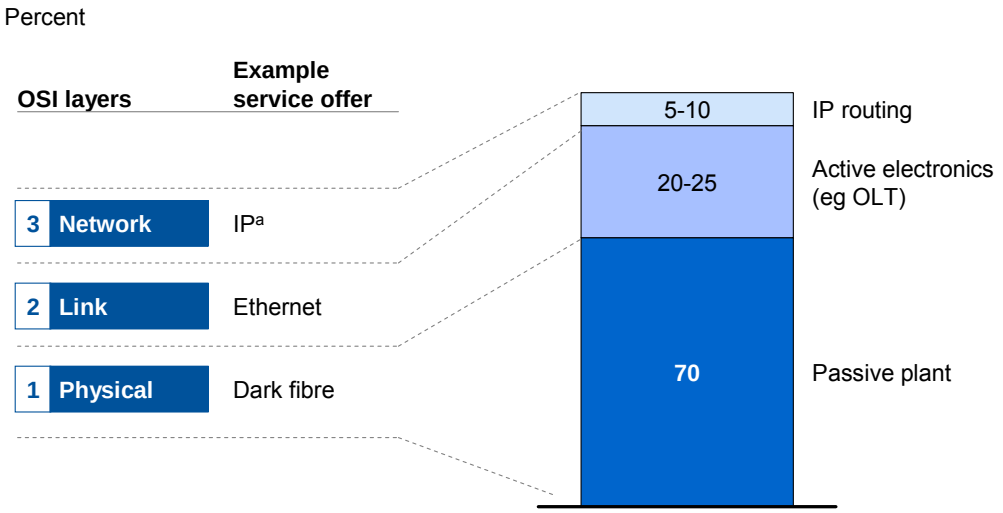
The NBN will make available all the necessary Ethernet network elements to create a Layer 3, likely IP, network at reasonable cost. The cost of routers and switches to create a national Layer 3 network is difficult to estimate without defining a specific configuration, but is an order of magnitude less than deploying active electronics (Exhibit 9–2). The levels of investment are expected to be viable for many participants in the Australian market. Regional operators could create Layer 3 functionality for a fraction of this amount.

It is reasonable to expect that given the low barriers to entry, wholesale Layer 3 providers will emerge—either as standalone businesses, or as wholesale arms of retail providers. Furthermore, national networks will not be required on day one. As NBN Co begins to commission POIs, Layer 3 operators can deploy equipment progressively, managing their investment and optimising their model as the NBN grows. In addition to wholesale providers, it is likely that there will be sufficient competition between Layer 3 retailers to ensure customers have access to a wide range of IP-enabled services. End users will receive better services, and more choice, in either case.

There are several participants in the Layer 3 wholesale market today, although mainly in the enterprise space, with national mass-market access offers served primarily by Telstra and Optus. These resale DSL services are no longer compelling for retailers—customer numbers at the largest provider, Telstra Wholesale, are declining rapidly.[211] Pricing and specifications of these wholesale products are unattractive to vertically integrated retail ISPs, who prefer to operate their own DSLAMs over unconditioned local loop (ULL) services. These wholesale products are typically intended for resale as Internet lines; there are no truly viable options for niche service providers to reach the home directly via a managed IP service

211 Telstra 2009, *Annual Report 2009*

Exhibit 9–2. Cost elements for providing national Layer 3 connectivity



a. Routing costs are highly dependent on network specifications and market share of operator
SOURCE: Implementation Study cost modelling; industry interviews

A diverse, mass market, national Layer 3 market could be slow to emerge. Most operators of Layer 3 networks initially will be retail ISPs and telecommunications carriers, who will focus on using their own IP services to deliver today's retail offers of broadband, voice, and TV. As a result, some services which require bespoke, new IP services—for example, home health monitoring that depends on real time class of service—may not be delivered immediately.

However, these services should in most cases be complementary to today's ISP and telecommunications services, and carriers could be expected to pursue these wholesale opportunities over time. A worst case scenario is possible if Layer 3 becomes commoditised, consolidated, and dominated by one or two national providers. In this case, a small number of concentrated providers could exercise control over the product offerings at Layer 3, and potentially foreclose retail competition. If Layer 3 competition is limited in particular regions, those areas would suffer from a

We're going to have quite a concentrated market at Layer 3 which will raise regulatory questions. Layer 3 infrastructure has to be built by someone - Telstra and Optus Wholesale are almost guaranteed - but beyond that it's quite tricky to see who would be prepared to build a Layer 3 network.

David Kennedy
Research Director, Ovum[212]

212 Crozier, R 2009, 'Ovum queries Layer 3 outlook under NBN mode', *itNews*, 7 December, viewed 15 February 2010, <http://www.itnews.com.au/News/162276,ovum-queries-layer-3-outlook-under-nbn-model.aspx>

poorer set of available options. Limited competition would also limit the prospects for ASPs and other non-carrier operators.

Should the Government conclude in the future that a Layer 3 market is not functioning, to the detriment of innovation and end-user benefits, intervention may be justified. One option would be to address shortfalls through regulation—for example, obliging retail service providers to offer a Layer 3 service which can support applications deemed important to the public interest. Another option, given the relatively low cost of deploying a national Layer 3 network, would be for Government to tender for the deployment of a Layer 3 service with Government as an anchor customer. Such a network could support public services such as health and education, as well as serving ASPs who are unable to source the wholesale services they require in the market.

At this stage, such measures would be premature. Ongoing ACCC monitoring of this market will enable Government to identify any further interventions that are necessary to foster healthy competition.

Highlight. It will be hard to judge the health of the Layer 3 market for some time, as it is currently nascent, and is dependent on emerging services such as smart grids and other ASP services. It will be difficult to create a simple test, such as market concentration. This market should be monitored and an expert review commissioned if it appears that further intervention is required.

Recommendation 63. That the Government request the ACCC to monitor and report annually on the market for Layer 3 telecommunications services.

9.2.4 RECOGNISING THE POTENTIAL IMPACT OF CONTENT CONCENTRATION

As the NBN creates a level playing field for network connectivity, content could become a basis for retailer differentiation. Content has been critical in other markets to promote consumer take-up and differentiate fibre from legacy broadband networks. For example, in the USA, Verizon is able to deliver a pay TV offering over its FiOS network which contains the same core content offers as Comcast's cable network. Australia's content market is concentrated; there is a risk that today's incumbent content owners may translate this concentration into a strong influence over the market for retail telecommunications services delivered over the NBN. The importance of content as a strategic tool has been seen in Singapore, where the English Premier League rights are a significant driver of consumer preference, and have been hotly contested between Singtel and StarHub.[213]

213 ipTVnews 2009, 'SingTel wins rights to English Premier league', *ipTVnews*, 2 October, viewed 16 February 2010,

Business models for the delivery of content—particularly premium video content—may change radically over the period of the roll-out. It is difficult for the NBN to influence today's content market dynamics, but it can ensure that the conditions exist for future content business models to emerge. In practice, this means supporting open-access platforms wherever possible, for example, in any TV/video distribution services contemplated. This principle should be incorporated in the formulation of the NBN services portfolio as detailed in Section 3.2.

Beyond the NBN, a range of other regulatory issues will also strongly influence the sustainability of competition in the content and application markets supported by the network. These include net neutrality (content non-discrimination), local content laws, cross-media ownership restrictions, anti-siphoning regulations, spectrum planning and broadcast licensing.

9.2.5 RECOGNISING THE RISK OF RETAIL MARGIN EROSION LIMITING INNOVATION

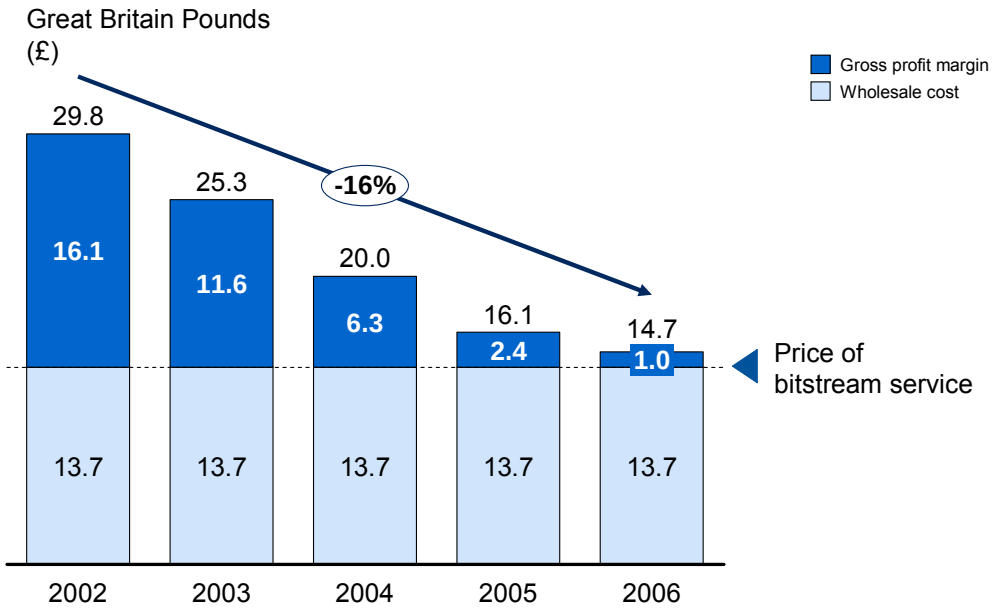
The desire to facilitate competition by smaller service providers on an equivalent basis, if taken to the extreme, could stifle innovation by allowing insufficient scope for product differentiation. If the wholesale product is already highly specified, the retail service provider is likely to become a reseller, providing marketing, sales, billing, and support services, but limited value-add in service functionality—a model currently seen in the electricity retailing market.

A likely outcome under this scenario is strong price competition, with the benefit of cheap products for consumers, but the risk of stagnation in the market due to the lack of sufficient returns to fund innovation.

The UK market experienced such an aggressive, resale-driven market between 2002 and 2006, as shown in Exhibit 9–3. During this time, innovation and network upgrades were limited, and price-based competition prevailed. Tiscali, Wanadoo, and Pipex all emerged as competitors to BT, with offers positioned largely on price rather than features, and usage caps employed to reduce entry-level price points.

<http://www.iptv-news.com/iptv_news/october_09/singtel_wins_rights_to_english_premier_league>

Exhibit 9–3. Effect on margins of competition in UK DSL Internet market



SOURCE: Ofcom; Implementation Study

While such an outcome may seem superficially attractive for consumers in the short-term, the lack of investment in technological innovation and upgrades in such a dynamic industry would quickly lead to Australia falling behind other developed nations. Ultimately, such unsustainable competition is likely to end in consolidation and the erosion of the short-term advantage to consumers.

The risk of a commodity resale service price war in the retail market can be mitigated by preventing NBN Co from operating at Layer 3 (at least initially) and providing service providers with a portfolio of Layer 2 Ethernet products instead, to enable them to manage their own routing, backhaul capacity, CPE, and interconnect arrangements. Today, we see ULL operators using ULL to deploy IPTV and sophisticated VoIP solutions including hardware. Those same services could be deployed over the NBN using Layer 2 services and the available ports on the ONT. There will then be scope for premium service providers to differentiate themselves from low-cost operators that just sell best-efforts Internet connectivity at the lowest possible price.

Given the uncertain nature of telecommunications market evolution, such a premium strategy will not necessarily be available to retail providers. For example, this strategy would be frustrated if the evolution of the market led to a scenario where innovation had moved predominantly to the cloud—to managed standalone applications—or to devices, with a limited intermediary role for the retailer. The best way to judge whether a healthy market is evolving will be to compare the services available in Australia to international markets, to verify that separation of Layer 2 and Layer 3 services in the industry structure

is not preventing the deployment of value-creating services. For example, retail providers around the world may deploy useful services which remain unavailable in Australia due to a lack of appropriate network services at economic prices.

Highlight. NBN Co's open-access, wholesale-only status does not preclude the development of suboptimal downstream market structures. A suite of measures will be required to pre-emptively mitigate the risk of these outcomes, and to ensure that the evolution of the NBN ecosystem is closely monitored.

9.3 Ensuring scope for competitive investment in service innovation

In scale and scope, the NBN initiative surpasses most other fast broadband network initiatives around the world. Moreover, both the market context and approach to the roll-out in Australia are substantially different to those seen in other countries. Telstra is pre-eminent in the telecommunications sector, and has unmatched resources to support building a position in the new industry structure. These unique circumstances must be considered when understanding how competition and a vibrant retail market structure can best be promoted through the NBN in the long term.

Two subsections follow:

9.3.1 Choosing the mode of competition for broadband infrastructure

9.3.2 Accepting a single passive infrastructure for the long term.

9.3.1 CHOOSING THE MODE OF COMPETITION FOR BROADBAND INFRASTRUCTURE

Next-generation broadband access networks are being deployed in many countries around the world. There are broadly two different ways in which competition is being safeguarded in those markets:

- Alternative network infrastructures with vertical integration;
- Open access to a shared passive network that stimulates competition at the active layer.

Alternative network infrastructures with vertical integration

Competition between alternative networks has stimulated the roll-out of next generation broadband infrastructure in several countries around the world. If multiple, competing networks exist in the same area, such as copper and hybrid fibre coaxial (HFC), the operator of one network may invest in an upgrade to enable services more appealing to consumers, thus placing pressure on the second operator to upgrade the alternative network so that its services remain competitive.

Alternative network competition has emerged in countries where legacy cable television networks operate in parallel with the copper telephone network, such as the United States. At the time these cable or HFC networks were deployed, they were dedicated to providing pay TV and did not compete with telecommunications networks. Technical advances soon followed which allowed Internet and voice services to be delivered in conjunction with television over the same HFC infrastructure. Cable and telecommunications companies found themselves competing to provide substitutable services, and were compelled to match each other's performance improvements.

Exhibit 9–4. United States: Access holiday increases returns for fibre roll-out

Case study: United States	
Cable companies move into broadband Internet and voice	Comcast launched its cable modem service, Comcast@Home, in 1996. By 2000, cable providers had around a third of the broadband market, and were gaining share in voice. Through the mid-2000s, triple-play offers from the cable networks posed a significant competitive threat to the telephone companies. Their response was to offer broadband and TV services which could not be delivered over full copper loops from the exchange.
Access holiday instituted	In 2004, the Federal Communications Commission (FCC) announced that, to create greater incentives for investment, new mass-market fibre roll-outs need not be unbundled, other than for voice services.[a] This access holiday contrasts to the strong unbundling requirements placed on existing copper networks under the 1996 US Telecommunications Act.[b] The FCC held that competition from HFC and copper infrastructure meant that the access holiday could provide incentives without unduly reducing competition.
Verizon and AT&T deploy fibre	The combination of competitive pressure from cable operators and the regulatory holiday spurred fibre roll-outs by the two largest United States telecommunications companies, Verizon and AT&T. Verizon began deploying its US$23 billion FiOS FTTP network in 2004, initially delivering up to 50 Mbps download speeds and 20 Mbps upload speeds. The same year, AT&T began its U-Verse FTTN deployment, using VDSL technology capable of delivering download speeds of 18 Mbps and upload speeds of 1.5 Mbps.
Roll-out reaches 15 percent of homes	In total 17.2 million or 15 percent of US had been covered by FTTP deployments by September 2009—compared to 180,000 homes with FTTP access at the time the access holiday was enacted. Actual take-up of services stands at 5.3 million homes connected to FTTP, with 1.5 million connected in the twelve months to September 2009.[c] The Verizon network has now passed 14.5 million premises, or ~45 percent of Verizon's total network footprint.[d] AT&T's FTTN network passed 17 million households as of the beginning of 2009, with plans to pass 30 million by the end of 2011.[e] Roll-outs of both AT&T and Verizon have primarily targeted high value (i.e. income) households.
Subsidies to improve regional services	Government announced US$7.2 billion in 2009 to bring high-speed broadband to unserved and underserved areas. This will be delivered over 2 years through the Departments of Commerce and Agriculture as part of the Obama Administration's economic stimulus package.[f]

a. FTTP deployments are only required to provide an unbundled voice service where the roll-out is in a brownfield area. In the case of 'hybrid' networks such as to the building/node/curb (FTTB, FTTN and FTTC), where there is a copper line to the end user, the incumbent must provide an unbundled voice service regardless of whether the roll-out is in a greenfield or brownfield area.

b. Hundt, R 2000, You say you want a revolution: A story of information age politics, Yale University Press,

c. FTTH Council, North American fiber to the home connections surge past five million, media release, Houston, 29 September 2009

d. Verizon 2009, *FiOS Fact Sheet,* media release, New York, 30 June 2009

e. AT&T, AT&T to invest more than $17 billion in 2009 to drive economic growth, media release, Washington, D.C., 10 March 2009

f. United States Office of Management and Budget 2009, Analytical perspectives: Budget of the U.S. Government, fiscal year 2010, Washington, D.C.

Source: Telecommunications Industry Association, Screen Digest, Implementation Study

As the speeds available over cable started to outstrip those achievable on copper, telecommunications operators responded by deploying more optical fibre, terminating ever closer to customers' premises to deliver competitive performance over an ever shorter 'last mile' of copper. AT&T, for example, deployed extensive FTTN infrastructure, employing a very short copper run for services including IPTV (Exhibit 9–4). The latest generation of HFC software upgrades, DOCSIS 3.0, have delivered speeds high enough to force US telecommunications companies, such as Verizon, to start providing optical fibre directly to the premises.

An important enabler of this vertically-integrated competition was regulatory certainty. Both providers were given certainty by the Federal Communications Commission (FCC) that there would be no requirement for competitor access to their networks. While this compromised competition within each platform, it enabled both providers to formulate investment cases with confidence, and invest significantly in their deployments.

There are several downsides to granting such monopoly guarantees without coverage obligations. One is cherry-picking, in which providers seek to serve only the most profitable areas and households. The second is rent-seeking (charging high prices), which can reduce penetration of services. While it is not apparent that the US has suffered from constrained deployment or take-up, the FCC has signalled an intent to encourage even broader roll-out of superfast services with its 100 Squared initiative. This initiative aims to deliver 100 Mbps to 100 million premises in the US.[214]

Competition between alternative network infrastructures can also be created by horizontally separating a provider who operates two parallel networks. For example, separation of the HFC and copper wireline businesses of Portugal Telecom (PT) in that country led to strong infrastructure-based competition and an anticipated coverage of 25 percent of the population with FTTP by the end of 2009, as described in Exhibit 9–5.

Open access to a shared passive network stimulates competition at the active layer

Open-access requirements compel the infrastructure owner to grant all downstream service providers, including its own retail or downstream businesses, access to its network on equivalent terms. The goal of open-access policies is to create a level playing field that promotes competition rather than allowing a passive infrastructure owner to leverage market power to foreclose downstream competition, an incentive that inevitably exists for bottleneck asset owners. To reduce incentives to frustrate the requirement of equivalent access, a number of governments around the world are also considering or have implemented vertical separation of the incumbent telecommunications company.

214 Atkins W 2010, 'FCC wants 100 Mbps Internet speed by 2020', *iTWire*, 17 February, viewed 18 February 2010, <http://www.itwire.com/your-it-news/home-it/36911-fcc-wants-100-mbps-Internet-speed-by-2020>

Exhibit 9–5. Portugal: Horizontal separation leads to infrastructure competition

Case study: Portugal	
Voluntary spin-off of the HFC network	In response to a hostile takeover bid, incumbent telecommunications provider Portugal Telecom (PT) voluntarily spun off its HFC business in 2006 to create the new cable company ZON Multimedia. ZON inherited PT's HFC network, covering 80–85 percent of the population. This voluntary separation was expected to create value as an alternative to the bid by rival Sonaecom
Infrastructure competition leads to fibre deployment	ZON became a strong competitor to PT's wireline services. Aiming to capture greater market share, it upgraded its transmission system using DOCSIS 3.0 technology, delivering up to 200 Mbps to end users. Unable to match these speeds with copper services, PT began an aggressive FTTP deployment across the country, with the aim of passing 1 million homes (25 percent of the population) by the end of 2009[a]. PT has focused its roll-out on regions where penetration is expected to be 30 percent or more, which are generally business and high income residential areas.
No major government involvement	The Portuguese Government made €100 million available in subsidies for FTTP roll-out, but there was little take-up of the offer because of attached facilities-sharing requirements. There are no official government fibre coverage aims as of 2009.
Multiple providers deploying FTTP	Facing increasingly compelling service offerings from ZON and PT, Soneacom has now begun a rival FTTP roll-out. However, fibre providers are having difficulty differentiating their services given the availability of 200 Mbps cable Internet and IPTV over DSL.

a. Portugal Telecom, PT aims to cover one million households with fibre by the end of 2009, media release, Lisbon, 14 May 2009

Source: Implementation Study

The principal drawback of this approach is that it can be challenging to stimulate investment in open-access passive infrastructure. Such investments are capital-intensive and face significant revenue risk if downstream operators do not commit decisively to deploying electronics and selling services. Government subsidy has typically been required to stimulate the construction of open-access fibre infrastructure, with two models prevailing: sponsorship of an incumbent telecommunications provider to undertake the deployment; or the establishment of a new vehicle to build and operate the network.

Japan and South Korea have both achieved impressive coverage through cooperation between Government and the incumbent provider. In 2008, 24 percent of Japanese households had fibre connections, after the incumbent provider, NTT, was granted tax concessions and other incentives to roll out fibre, and was subjected to an open-access regime that was designed to enable commercial returns (Exhibit 9–6).

In Korea, substantial direct government investments through the incumbent, Korea Telecom (KT), stimulated the country's rise to first place globally on broadband and fibre penetration (see Section 9.5). A similar approach has been adopted by Malaysia under the Malaysian High-Speed Broadband Plan.

Exhibit 9–6. Japan: Government supports NTT fibre roll-out

Case study: Japan	
Incumbent fibre roll-out with subsidies	Japan has the world's fastest average broadband speeds and second highest penetration of FTTH (to Korea) at 11.3 subscriptions per 100 people—24 percent of Japanese households.[a] The majority of this fibre roll-out has been established by the incumbent NTT, taking advantage of a package of tax incentives including accelerated depreciation and deductions for business users, as well as low-cost loans.
Already vibrant broadband market built on access regime	Access to copper was mandated in 1999, with prices set low to reflect the marginal economics of operating and maintaining a fully depreciated network. These moves spawned strong competitors in the DSL market and took Japan from broadband penetration of below 1 percent in 1999 through to 68 percent today.[b] Competitive pressures from DSL, cable and smaller fibre deployments compelled NTT to roll out its FTTP network. Today, fibre is the dominant mode of broadband access in Japan, having overtaken cable in mid-2008.
Open access but with high prices	While NTT is required to grant open access to its fibre network, prices set by the regulator are high enough to guarantee returns on the investment and prevent competitors from undercutting NTT's retail price. Regulated wholesale fibre access prices at 5,200¥ (A$60) per user per month are 4–5 times greater than copper local loop, reflecting that the network is not yet fully depreciated. This leads to retail prices of ~A$75 per month for an uncapped 100 Mbps connection. The Japanese regulatory agencies take an active approach focused on market outcomes, and plan to reassess the access regime and prices in 2010.
Incumbent maintains high market share	While granting open access to its dark fibre, NTT provides retail services and therefore competes against its wholesale customers. As a result, it has strong incentives to maintain retail market share through price and non-price levers and has successfully used them to maintain over 70 percent retail market share of FTTH, with the remainder consisting primarily of customers connected to competing networks—primarily by maintaining small differences between wholesale and retail prices, limiting the margins available to access-seekers.
Ubiquitous coverage	Through subsidies and incentives, the government aims to have FTTH available to over 90 percent of Japanese premises by 2010 as part of its U-Japan Internet policy (U for ubiquitous)[c].

a. FCC 2009, *Next generation connectivity*, report prepared by Y Benkler, Harvard University Berkman Center for Internet & Society, Cambridge, MA. The apparent discrepancy is the result of inclusion of 3G wireless services in the household data

b. Ibid

c. Japan Ministry of Internal Affairs and Communications 2006, 'Approaches to nationwide installation of broadband', Communications News, 8 December, viewed 15 December 2009, <http://www.soumu.go.jp/main_sosiki/joho_tsusin/eng/Releases/NewsLetter/Vol17/Vol17_17/Vol17_17.html>

Source: Implementation Study

Separate start-up networks are being pursued by the New Zealand and Singaporean governments. New Zealand intends to create a series of regional fibre operating companies with partial Government ownership, and is still at the stage of consultation and requesting tenders.

Singapore's Next Generation Network, on the other hand, applies government investment to structurally separated, privately held, passive and active infrastructure companies (Exhibit 9–7).

Exhibit 9–7. Singapore: blank sheet investment, structurally separated from Day 1

Case study: Singapore	
Government funds fibre roll-out	The Singapore Government announced in 2005 its Next Generation Nationwide Broadband Network: a ubiquitous FTTP network to be rolled out across the island nation as part of the Intelligent Nation 2015 plan. Public investment of US$1 billion has been earmarked to fund the roll-out through a series of 'blank sheet' companies.
95 percent coverage by 2012 at 1 Gbps	Singapore's deployment plan aims to have 95 percent coverage of premises with 1 Gbps (1000 Mbps) FTTH connections by mid-2012, with 60 percent coverage by the end of 2010 [a]. These coverage goals are aided by the fact that Singapore is a city-state, reducing the tail end of low density, high cost deployment areas.
Vertically separated from day 1	The companies deploying the FTTP network were created as two vertically separated entities to ensure open access: NetCo and OpCo. NetCo is responsible for passive fibre infrastructure, and OpCo for active equipment (including OLTs and routing equipment) and the provision of wholesale bitstream services. OpCo's wholesale services support retail providers responsible for developing and commercialising voice, data and video.
Cooperation from incumbents	The tender for NetCo (now called OpenNet) was awarded to a consortium including incumbent telecommunications provider Singtel, which owns a 30 percent stake. Singtel retains ownership of ducts, buildings and civil works and leases them in the short term on a commercial basis to OpenNet, but is required to divest these assets into a third company (AssetCo) by 2014 [b]. The tender for OpCo (now called Nucleus Connect) was awarded to Singapore's number two broadband provider, StarHub. The results of these tenders mean that migration from existing network infrastructure can take place in a coordinated rather than competitive environment.
Construction underway	Construction began in 2009, with projected coverage of 15 percent of Singapore's premises by the end of that year [c].

a. OpenNet Singapore 2009, *Fibre rollout*, viewed 10 November 2009, <http://www.opennet.com.sg/network-rollout/>

b. TelecomTV 2008, 'Separation pangs: Singapore's radical network plan highlights fiduciary issues', *TelecomTV One*, 3 October, viewed 10 November 2009, <http://www.telecomtv.com/comspace_newsDetail.aspx?n=43934&id=e9381817-0593-417a-8639-c4c53e2a2a10#>

c. Chai, W 2009, 'Counting down to superhighway', *The Business Times*, 28 October 2009

Source: Implementation Study

Additional case studies on South Korea, Malaysia, Sweden and New Zealand can be found in Section 9.5.

9.3.2 ACCEPTING A SINGLE PASSIVE INFRASTRUCTURE FOR THE LONG TERM

Although both modes of competition discussed in the previous section are viable, infrastructure competition has drawbacks. It creates competition at the layer where innovation is limited—trenches and cables are commodity products—and results in duplicated infrastructure. For example, many houses in the United States and Europe are connected to two networks—cable and fibre—which deliver identical service offerings. Although they benefit from competition, there is capital inefficiency in providing the multiple physical connections for each household. And despite the large capital investments of network operators, there are still many households in most developed nations which are not connected to a high-speed network.

Highlight. The creation of a single national open-access fibre customer access network is economically efficient, as it avoids wasteful duplication of infrastructure.

It is therefore reasonable to take measures to facilitate the creation of a single, national, economically viable, superfast broadband network. A major risk to creating a viable nationwide network is cherry picking, where private firms could compete with NBN Co selectively in the lowest cost regions. This is because the economics of the NBN vary from most profitable in high density, high usage areas to least profitable in low density, low usage areas.

While the competitive pressure of alternative network builders may seem beneficial, such investments result in duplicated investment while eroding NBN Co's revenue share in the most profitable areas, and will make it more expensive—in present value terms—for NBN Co to reach its coverage goals. Such selective competition is inconsistent with the aspiration of creating an open-access fibre customer access network that extends to less profitable regions, particularly with an objective of uniform pricing of the access network. This issue is discussed further in Chapter 10.

Highlight. Competing networks will erode the economics of the NBN if allowed to cherry pick the most attractive areas.

The long-term implications of network diversity may, however, be difficult to judge—today's duplication may be tomorrow's network-based competition. Twenty years ago, cable and telephone connections clearly did not duplicate one another, as they delivered different and complementary services. With this in mind, we must entertain the prospect that alternative networks may offer useful diversity in future. For example, where NBN Co deploys a shared/split fibre architecture, allowing a competitor to deploy home-run fibre alongside NBN Co's fibre may have future benefits, if a large percentage of the

market begins to demand services which cannot be delivered over a shared/split fibre topology. While it is appropriate to allow a monopoly passive fibre network to be built on open-access terms, competitors should still be allowed to construct competing networks on reasonable terms, while meeting similar public interest obligations.

Permitting active- and passive-layer integration in the near-term

If a single, passive architecture is endorsed, international experience suggests that the prospect of active-layer competition becomes critical to the long-term health of the market. However, this objective must be reconciled with near-term market realities. While it is important to enable active competition as new generations of technology become available, offering dark fibre access to facilitate this in the short term has significant drawbacks:

- **Potential scale concentration in the active layer.** Few providers would be able to take up the dark fibre service nationally, resulting in limited competition benefits in the near term. There are also technical constraints to nationwide competition. In areas where a shared/split topology (designed for GPON active layer services) is deployed, local splitter-level monopolies would be created, as there is currently no technology to enable sharing of split feeder fibres across multiple active-layer providers;
- **Reduced flexibility in service pricing.** The NBN Co faces a difficult task in driving take-up for new services, with untested demand and a large capital base on which to achieve a return. Flexibility to differentiate pricing by service and user type will be important to achieving take-up and usage on the network. Offering dark fibre too soon is likely to reduce scope for price differentiation in the market;
- **Inefficiency of multiple wholesalers.** Allowing multiple wholesalers from Day 1 would be inefficient and hard to make work commercially for either Government or a private investor. Active electronics are still a significant percentage of the cost, and are significant per household—especially if duplicated by multiple operators**;**
- **Increased complexity of deployment.** Deploying an active network requires the establishment of fibre exchanges (similar to, although smaller than, today's copper exchanges), and the installation of customer ONTs. Coordinating the passive fibre deployment with the installation of competing active electronics would add substantial complexity to the build;
- **Ability to improve NBN Co's commerciality.** Offering active rather than merely passive services allows the company to differentiate pricing between a greater diversity of products to maximise both penetration and revenue. NBN Co can extract more value from the active layer, at a wider range of price points, and thereby cross-subsidise the passive investment.

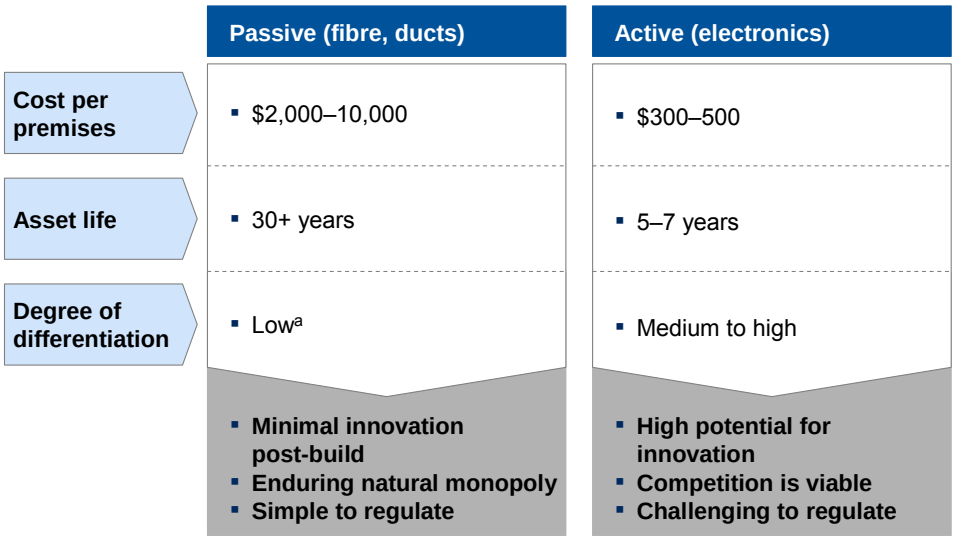
Achieving dynamic long-term outcomes at the active layer

As shown in Exhibit 9–8, the active-layer electronics advance far more quickly, and independently of, the underlying fibre asset. Having set the course for a single passive fibre infrastructure, the Government must consider how to achieve appropriate dynamic outcomes—innovation, upgrades, and efficiency gains—at the active layer.

The pace of active layer evolution should not be underestimated. Although the NBN's initial fibre access network data rates of 100 Mbps seem ample today, these speeds may well seem insufficient by the conclusion of the roll-out in 2018–19. For reference, consider that the compound growth rate of home user speeds between 1990 and 2010 doubled roughly every 18 months. Applying this growth rate to a 5 Mbps service as a baseline today (some users receive 20 Mbps or above in Australia, and over 50 Mbps in other countries), this would grow to the full 100 Mbps by 2018.

Previous generations of networking equipment have been superseded every 5–10 years—dial-up modems, DSL, ADSL2+, are all examples of this. There is already evidence of this in PON FTTH. BPON/APON was developed as a standard in 1995, and commercialised shortly thereafter, enabling speeds of up to 622 Mbps (shared across users by optical splitting). In the following 10 years, GPON and EPON standards were developed, offering over twice the speed of BPON, and both have been widely deployed

Exhibit 9–8. Difference in industry characteristics of passive and active



a. Depending on network architecture, but once built, passive network unlikely to be upgraded for 30+ years
SOURCE: Implementation Study

around the world.[215] Already the successor technology—offering 10 Gbps speed—is under development, and is likely to be commercially available in a few years.

Assuming an average 7 years between generations of technology, the passive fibre infrastructure is likely to last through at least 5 generations of active technology upgrades. Navigating these upgrade transitions and deciding the economically optimal time to move to a new technology will be challenging in the absence of market mechanisms.

Chapter 10 discusses potential mechanisms for achieving competitive outcomes at the active equipment layer. It is worth noting that access can be granted deeper in the network than bitstream, through wavelength unbundling or direct physical fibre access. Currently, true optical access at the wavelength level is not commercially available for mass market GPON applications, but is technically possible.

215 OECD 2007, *Developments in fibre technologies and investment*, Directorate for Science, Technology and Industry, Paris

9.4 Anticipating potential adverse monopoly conduct by NBN Co

NBN Co will be a powerful participant in the Australian telecommunications market, and the owner of what will be a future bottleneck asset. At the passive layer, NBN Co is likely to have a monopoly on mass market fibre access. During the time in which it is the sole operator of active electronics on its fibre, it will also be a vertically integrated wholesale monopoly with control over the nature and pricing of the broadband products which power Australia's digital economy.

While NBN Co should be encouraged to use its powerful position to deliver a solution for today, it must not be allowed to become the central obstacle to competition in the future. This is particularly important given the prospect of private ownership, as the unpredictable evolution of the industry will make it more difficult to balance private shareholder interests with public policy goals.

While NBN Co's open-access, wholesale-only nature mitigates some of the risks of the company strengthening its position by interfering in downstream markets, it is by no means a complete or permanent solution to the broader problem of monopoly conduct. This section describes possible modes of NBN Co behaviour that could threaten competition in the future, in three subsections:

9.4.1 Anticipating the risk of an NBN Co monopoly expanding its scope

9.4.2 Anticipating the risk of an NBN Co monopoly operating inefficiently

9.4.3 Anticipating the risk of an NBN Co monopoly failing to innovate.

9.4.1 ANTICIPATING THE RISK OF AN NBN CO MONOPOLY EXPANDING ITS SCOPE

If operating on a purely commercial basis, NBN Co would have incentives to leverage the natural monopoly portion of its business—access and backhaul—to expand the scope of its activities. This could occur along three dimensions:

- **Vertical integration up the logical stack.** As an operator of active electronics at Layer 2, there is scope for NBN Co to offer increasing functionality. Indeed, the demarcation between Layers 2 and 3 is already becoming blurred, with functionality such as Internet Group Management Protocol (IGMP) snooping, which inspects packets to provide TV functionality. This scope creep could result in the company effectively competing against its own customers in the provision of Layer 3 services, exercising undue influence over the availability and pricing of various retail

services, engaging in harmful price discrimination and stifling competition from independent Layer 3 platforms;

- **Vertical integration into other markets.** It is possible that NBN Co would pursue opportunities in markets for other network elements, or even devices and content. For example, the company could potentially seek to offer a national backhaul transit product. Such a product would likely meet customers' needs, and represent a value creation opportunity—but would likely exceed the reasonable mandate of NBN Co;
- **Expanding scope of customers.** Although established as a wholesale-only player, NBN Co may seek to sell services to end users—particularly sophisticated large businesses with private networks.

Unless explicitly mandated by Government, each of these modes of expansion should be anticipated and prevented. In some cases, it will be possible to address these issues through simple constraints—for example, a customer test to limit direct selling by NBN Co, as discussed in Section 10.2. In other areas, service unbundling, open-access requirements and measures to eliminate underlying incentives for undesirable conduct may be required. These mechanisms are discussed further in Chapter 10.

9.4.2 ANTICIPATING THE RISK OF AN NBN CO MONOPOLY OPERATING INEFFICIENTLY

NBN Co, as a monopoly after completion of the roll-out and if the copper and HFC networks are deactivated, will lack competitive pressure to optimize its operations. This could lead to several adverse outcomes for the industry:

- **Higher prices charged to operators.** In the absence of competitive pressure, NBN Co will have limited incentive to engage in rigorous cost management. If costs increased, or did not decrease in line with industry best practice, this inefficiency would likely be passed onto customers, subject to the regulatory regime. NBN Co would also have the conventional monopoly incentive to raise prices to the point of profit-maximisation, again subject to the regulatory regime, although this would be mitigated prior to privatisation by a combination of Government ownership and control and transparency around take-up targets. Whether driven by poor cost control or profit maximisation, increased prices would dampen take-up, shrink the revenue pool for retail service providers and reduce the social and economic benefits of the NBN.
- **Poor quality of service.** This is a common concern for monopoly infrastructure providers. There are already a substantial, and growing, number of complaints about telecommunications services under the current market structure—Telecommunications Industry Ombudsman complaints have tripled in the last two

years.[216] During the first decade of operation, the NBN will be activating and provisioning customers continuously, and providing a good service experience will be vital to drive take-up. Once copper deactivation occurs, the pressure to meet service expectations will be greatly reduced.

Both these issues can theoretically be addressed through hard metrics. However, in reality these behaviours are dynamic and rely on actions within NBN Co which are difficult to monitor. Therefore, the focus should be on incentives, such as allowing the company to share in productivity gains, and setting standard SLAs with appropriate penalties and reporting obligations.

9.4.3 ANTICIPATING THE RISK OF AN NBN CO MONOPOLY FAILING TO INNOVATE

Analogies are frequently drawn between telecommunications and non-telecommunications utilities like owners of water, gas and electricity distribution networks. Although there are similarities in their infrastructure-focused role in their respective industries, the reality is more subtle. In providing Ethernet bitstream connectivity, the company necessarily offers a more complex portfolio of services than a traditional utility such as a water or electricity provider. The specification of these products will define the shape of the industry, and the performance of communications services across the nation.

If NBN Co is the sole provider of superfast broadband bitstream services over the long term, it is unlikely that technology upgrades to provide improved services will be implemented at the optimal rate. There are several reasons for this:

- **Demand typically lags the introduction of higher speeds.** Not until sufficient content, applications, devices, and backbone capacity are all available do most users see the value in moving to faster services. It is to some extent a virtuous cycle, once the network investment has been made, but it can be difficult to develop an investment case for an upgrade ex-ante in the absence of competitive pressure;
- **Latent demand is best proved by competition.** Comparing the US and Australia is instructive: the US market has seen unprecedented investment in both passive and active networks, which have been built by private operators competing for customers, funded through private capital and end user revenues. Consumers now perceive real value in Verizon's fibre TV offering, with penetration at 25 percent for the FiOS TV offer within the coverage area,[217] but this would not have been

216 ACMA 2009, *Communications report 2008-09*

217 Spangler, T 2010, 'FiOS Hits Brakes At End Of 2009', *Multichannel News*, 26 January, viewed 16 February 2010, <http://www.multichannel.com/article/445901-FiOS_Hits_Brakes_At_End_Of_2009.php>

deployed without competitive pressure from cable TV triple plays. Rich broadband services are proliferating in the US. Conversely, Australia has seen limited investment in fixed access networks and limited service innovation;

- **It is difficult to force upgrades through regulation.** The underlying fibre asset is fairly easy to regulate as most of the investment is upfront and no subsequent decisions are required about new technologies. This situation is similar in principle to that of power lines, and fibre assets can be operated and regulated in much the same way as a traditional utility. Active components (to provide Layer 2 services) are more challenging, and barring substantial advances in regulation, should not be a monopoly if not in Government hands.

Highlight. Endorsing NBN Co as a monopoly operator carries inherent risks that need to be managed to prevent adverse future conduct, namely, NBN Co:

1. Expanding its scope of activities beyond those needed to achieve policy goals;

2. Operating inefficiently;

3. Lacking incentives to innovate.

9.5 Learning from international experience

Exhibits 9–9 to 9–12 provide additional international case examples to those included earlier in this chapter.

Exhibit 9–9. South Korea: Government funds fibre roll-out through low-cost loans

Incumbent fibre roll-out with subsidies	South Korea has the world's leading fibre and broadband deployment due to very high levels of government support—over US$70 billion in low-cost loans and US$1 billion for coverage of regional and remote areas of the country. This is in addition to other direct subsidies, tax breaks, research funding, demand stimulus programs and concessions.
High density living patterns aid roll-out	Over 80 percent of the Korean population lives in high-density urban housing, which reduces the cost of fibre deployment (and broadband generally) relative to other less densely populated areas. Additionally, the local loops within these buildings are owned by building owners rather than the incumbent telephone operator, so attackers can gain access more easily to install competing equipment. Korean consumer behaviour also favours high-speed broadband take-up in a number of respects [a].
Infrastructure competition also important	In addition to government subsidies, vigorous infrastructure-based competition from DSL and cable provided further incentive for incumbent Korea Telecom (KT) to roll out fibre. These broadband technologies were first introduced to the Korean market by competitors Hanaro and Thrunet in the late 1990s. (The two companies merged in 2005 and are now SK Broadband, part of the large SK conglomerate.)
1 in 3 households now have fibre	By 2007, 94 percent of Korean households had broadband access and one third of connections were over fibre. The incumbent retains over 50 percent share of the fixed broadband market.

a. Benkler, Y. et. al. 2009, Next generation connectivity

Source: Implementation Study

Exhibit 9–10. Malaysia: Government and TM form joint venture for fibre roll-out

Limited broadband take-up	Despite government aims to reach 75 percent broadband penetration by 2010, Malaysia has not kept track and has had to revise its targets. Official coverage objectives now call for 50 percent broadband deployment by 2010. However, as of 2009, the figure stands at ~20 percent, with DSL being the primary mode of connection.[a]
JV formed to deploy fibre	To stimulate roll-out of fibre, the government formed a joint venture in 2008 with incumbent Telekom Malaysia (TM) as part of the High Speed Broadband Initiative, which aims to deliver speeds of 'at least 10 Mbps' to 1.3 million premises, or 14 percent of the population by 2012 using a combination of FTTH and fibre-to-the-curb (FTTC) with VDSL. These speeds will be increased eventually to 100 Mpbs for consumers and 1 Gpbs for business customers.[b]
Incumbent aligned with government	TM remains 42 percent owned by the Malaysian Government's public investment vehicle, Khazanah, so the incumbent's interests are more aligned with those of the government than in Australia. This makes cooperative outcomes more feasible.
Government invests 20 percent of total cost	The total cost of the project is projected at US$3–4 billion, with the government committed to contributing US$700–800 million, in addition to demand-side initiatives such as an e-government portal and connectivity for schools. (Malaysia's population is 25 million.) A revenue-sharing agreement requires the JV to distribute revenues to the government based on their equity contribution, provided revenue exceeds an undisclosed threshold, but it is expected that the government will make an economic loss on its investment.
Concentrated market structure remains	Although in principle Malaysia has an open-access wholesale regime with regulated pricing and restrictions on bundling, TM continues to hold a market share of over 90 percent. Competitors argue that the government's acceptance of TM's tender for fibre deployment has further entrenched the incumbent's monopoly, a situation they link to the relatively slow growth of broadband penetration in the country.[c]
Broader coverage through separate projects	Since a minority of households will receive fibre connections, a separate government program Broadband to the General Population will stimulate deployment of a combination of DSL and wireless technologies (primarily WiMAX) to deliver speeds of up to 4 Mbps.

a. Keong, L M 2007, 'Malaysia lowers broadband targets', *ZDNet Asia,* 11 September, viewed 12 December 2009, <http://www.zdnetasia.com/smb/news/0,39043754,62032069,00.htm>

b. Telekom Malaysia, *High Speed Broadband (HSBB),* viewed 10 November 2009, <http://www.tm.com.my/connecting-you/digital-lifestyle/hsbb/Pages/WhatsHSBB.aspx>

c. Heavy Reading 2009, FTTH review & five-year forecast: The road to PON and next-gen PON

Source: Implementation Study

Exhibit 9–11. New Zealand: Separation then investment via public-private partnerships

No unbundling until 2006	Until 2006, New Zealand was one of the only countries in the OECD not to impose an access regime requiring local loop unbundling of the incumbent's access network, and broadband penetration remained in the bottom third of OECD countries.[a] Following unbundling, the price charged by TNZ for a 2 Mbps DSL connection was cut from NZ$70 to $40 per month in one year.[b] By 2007 consumers were offered speeds and download limits that were 10 times those of 2005 for the same access price.
3-part functional separation	TNZ offered to reorganise voluntarily into wholesale and retail divisions, but to ensure equality of access to unbundled network services the government required further separation of the network assets division (later named Chorus). Three-part functional separation took effect in 2008.
Separation spurs broadband take-up	The performance of New Zealand on international broadband rankings has improved since 2006, with the country leapfrogging Austria, Italy, Spain and Portugal on penetration metrics. Some commentators argue this may be attributable to specific provisions of the separation package, where undertakings were made by TNZ to accelerate broadband roll out. However other players have also invested, including TelstraClear, the New Zealand subsidiary of Telstra, which deployed a new fibre ring connecting towns on the south island following separation.[c]
Government investment to broaden FTTH coverage to 75 percent	Although New Zealand's market reforms improved its broadband performance, the government—backed by industry groups—aims for higher coverage through a next generation network. In 2009 it announced the Ultrafast Broadband Initiative, with a target of 75 percent coverage by FTTH in 10 years. The government plans to invest NZ$1.5 billion and attract matching private sector funds. These 75 percent of premises will have access to 100 Mbps services. A further $300 million will be invested to provide alternative high speed technologies to regional and remote areas, giving 16 percent of premises access to 10 Mbps, 6 percent access to 5 Mbps, and 1 Mbps for the final 3 percent. Government funding will establish Local Fibre Companies (LFCs): public-private partnerships that will roll out the passive infrastructure of the FTTP network. The government intends to hold 25—50 percent of the equity in each LFC, and is willing to accept a 'less than commercial return for an initial period'. It is not yet clear what role TNZ will play.
Mandatory dark fibre access	The government will mandate dark fibre access to the new passive infrastructure to enable an open access network, on which a competitive wholesale and retail markets are expected to grow.
Planning still in early stages	Having been announced this year, the Ultrafast Broadband Initiative is at the stage of early discussions, with no tenders having been issued or any construction yet underway.

a. FCC 2009, Next generation connectivity

b. OECD 2009, 'Broadband statistics: Evolution of a representative broadband subscription over time', *Broadband Portal,* viewed 10 November 2009, <http://oecd.org/sti/ict/broadband>

c. FCC 2009, Next generation connectivity

Source: Implementation Study

Exhibit 9–12. Sweden: decentralised, local government provision of dark fibre

Decentralised local-government approach	In 1994 the Stockholm municipal government funded a dark fibre network for the city in response to the incumbent Telia Sonera's refusal to provide dark fibre access on its existing network. This approach has been extended nationally, driven by the investment of other municipalities and alternative operators such as Bredbandsbolaget. In March 2008, Telia Sonera responded with plans to cover 1.5 to 2 million households (35–45 percent of Swedish households) with FTTH, using VDSL for internal connections within apartment buildings. The basic model of the Swedish municipal network roll-outs is that the municipality builds passive capacity (dark fibre) and leases it to private providers who then compete on active services. The municipalities offer public tenders for the contract to build the fibre network. The process is used both in major cities, like Stockholm, and in smaller municipalities, and leads to a vibrant downstream market, with more than 90 client operators and retail providers leasing access in Stockholm alone.
National funding contributed	In 1999, the Swedish Government committed €600 million to the roll-out of a national fibre backbone by the operator of the national electricity grid. An additional €700 million has been contributed to regional and local broadband projects. Further funding is provided by metropolitan governments and it is estimated that private operators have spent US$1 billion between 2001 and 2007 rolling out fibre.
Coverage has reached 20 percent	Around 20 percent of Swedish households are now covered by FTTP, including apartments that make use of internal VDSL. The overall penetration rate of FTTH in Sweden is 7 percent—the highest rate in Europe, but representing a slow roll-out pace since it has taken 15 years to reach this level.

Source: Implementation Study