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The return of public investment in telecommunications: Assessing the early challenges of the national broadband network policy in Australia

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ABSTRACT

Against a current trend of investing in the next generation networks (NGNs) by using public funds, the Australian government has initiated a so-called National Broadband Network (NBN) project to invest up to AUD$36 billion tax payer's money on building a national wide fibre broadband network aiming to cover 93 per cent Australian by 2020. As being the most costly infrastructure-building project in Australian history, the NBN project promises to deliver super-fast broadband services, create jobs and promote the country's economy at large. This article will critically analyse the NBN project in Australia and highlight the challenges that are coming alone at this early stage of the deployment, so the Australia's experience of pubic investment in broadband networks can be shared and lessons can be learnt.

1. Introduction

It has been widely accepted in recent years that the impact of high-speed Internet access on the economy and society is vital. For this reason, investment in next generation networks has been receiving extraordinary attention from policy makers all over the world. Many governments have started considering broadband availability and affordability as an objective of social cohesion, and in fact, many of them released action plans.

The analysis of these policies has demonstrated a wide range of public measures to promote NGNs deployment, which created a number of different choices for policy makers. Countries are now deciding on which measure (or measures) would serve best the social and economical goals of their nation. During this process, some countries with effective and strong regulatory policies are forging ahead with a lively fibre footprint. Many European countries such as Sweden and the Netherlands provided such examples. Those policies aim to encourage investing in fibre infrastructure while promoting competition. Countries are also considering the option of using wireless technology so as to avoid the significant costs involved in fibre broadband deployment. On this point, the White House decision entitled '*National Wireless Initiative*'[1] of 10 February 2011 indicated the policy change of the US government from a national wide fibre broadband plan to new initiatives including promoting a comprehensive national wireless coverage, which is expected to be done at a much lower cost.

Nevertheless, the world has witnessed some new broadband policies in recent years with a distinctive feature of combining heavy public investments and active government participation. Countries such as Australia, New Zealand and Singapore are such examples.

There are various motives for public investment in telecommunications at national, regional or municipal level. Cave and Martin have summarised three main motives as being (i) social motive to achieve equity; (ii) industry motive to construct high-speed networks as an instrument for the provision of a faster broadband used both in production and in

[1] The White House. (2011). President Obama Details Plan to Win the Future through Expanded Wireless Access, the White House News Release.

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consumption; and (iii) an economic motive to reduce the deficit take over suffered in the recent economic downturn[2]. The same study further established the drive for setting up a public–private joint investment model in telecommunications infrastructure deployment. The authors highlighted the role of the government, stating that to:

> *"accelerate the spread of next generation broadband is a task requiring massive investments—on a scale that will normally be beyond the scope of public funding and accordingly, such investments should be planned within the framework of a public/private partnership (PPP) in which the government plays a coordinating and a partial financing role; the latter being designed to crowd in rather than crowd out public investment"*[3].

The recent National Broadband Network (NBN) Policy in Australia presented an interesting case on this respect with active participation from the Australian National government in the deployment of a nationwide fibre broadband network. A business-like government entity (NBN Co.) was also formed to carry out this significant mission.

The overall focus of this paper is to study Australia's NBN policy with an aim to highlight the challenges associated with this policy making. Part two of this paper provides a literature background concerning government intervention in broadband infrastructure. Part three examines the Australia's NBN project in detail and highlights four key challenges associated at this early stage of deployment. Part four contains conclusions.

2. A new paradigm of next generation networks policy

The diverse investment structure in high-speed broadband networks has been driven by a variety of market and non-market factors in the recent time. Countries like Japan and Korea have taken the lead in orchestrating the high-speed broadband initiatives in their region, while other countries are either carefully planning their broadband strategies or concentrating on the infrastructure upgrades to promote the building of the information society[4]. A core of this process is a profound focus on extending or constructing the NGN infrastructure that is always associated with significant capital input. As a result, the issue of infrastructure investment has come increasingly higher up on the agenda of governments culminating with policy initiatives in a range of countries. No matter what stage countries are currently at in perusing this undertaking, making the investment decision is inevitably the most important part.

2.1. *The re-appearance of public involvement in telecommunications*

Tracing back the development of the industry, investing in telecommunications has always been an issue heavily influenced by political and economical considerations.

The industry started with a so-called 'natural monopoly' status that covered several decades from the beginning of network deployment, and particularly from the end of the Second World War, up to the various crises in the seventies. Telecommunications were seen as a 'public matter' during this period. The service was normally provided by a public operator or a public company in most of the countries in the world.[5] In many cases, regulatory functions were carried out by the administrative authorities, on which the monopolists depended.

The natural monopoly period was followed by the liberalisation stage commenced from the late seventies and early eighties, which was driven by a variety of factors.[6] A common phenomenon in this process involved privatisation of the monopolist, progressive liberalisation of the industry and the market as well as making changes of regulatory regimes. Private firms started to take control of the market and the industry development gradually became an issue rely largely upon the private sector except few key infrastructures concerning national securities. In regard to the equality concern that was present during the entire period, many countries developed various policies such as the universal service obligation to address 'residual' problems on the supply side.[7]

The liberalisation and privatisation stage quickly resulted in some fast developments of the industry in many parts of the world, just as promised by the widely accepted market economy theories. Studies were also carried out to test the inter-relationship between fast development and liberalisation, many of which came up with positive findings. For example, Li and Xu used a large set of 177 countries over the period 1990–2001 to investigate the impact of privatisation and competition on telecommunication with ITU and World Bank data.[8] They find positive effects of privatisation on output, productivity and resource allocation although their estimates show that full privatisation increases both output and prices of telecommunications services.

Despite the fact that assertions promoting liberalisation have also received criticism[9], the continuous liberalisation

[2] Cove, M., & Martin, I. (2010). Motives and means for public investment in nationwide next generation networks. Telecommunications Policy, 34(505–512).

[3] Ibid.

[4] Falch, M., & Henten, A. (2010). Public–private partnerships as a tool for stimulating investments in broadband. Telecommunications Policy, 34, 496–504. Also see OECD. (2010). OECD Broadband statistics. Retrieved 12 April, 2011, from http://www.oecd.org/document/54/0,3746,en_2649_33703_38690102_1_1_1_1,00.html#Penetration

[5] J.L. Gómez-Barroso & C. Feijó. (2010). A conceptual framework for public–private interplay in the telecommunications sector. Telecommunications Policy, 34, 487–495.

[6] Feijó., C. G. m.-B., J. L., & Rojo Alonso, D.,. (2006). European competition law in the electronic communications sector: Evolution and critical analysis. Annals of Telecommunications, 61(7/8), 842–859.

[7] J.L. Gómez-Barroso & C. Feijó. (2010). A conceptual framework for public–private interplay in the telecommunications sector. *Telecommunications Policy*, 34, 487–495.

[8] Li, W., & Xu, C. (2004). The impact of privatization and competition in the telecommunications sector around the world. Journal of Law and Economics, 47(2), 395–430.

[9] Smallman, C., & Sun, X. (2004). Reframing privatisation: Deconstructing the myth of efficiency. Policy Sciences, 37(2), 159–183.

and privatisation process undertaken by many countries signified their willingness to transfer the investments in telecommunications to the private sector. Thus, only a few areas are left where public investment has continued such as research/education and service provision in remote/rural areas.[10]

Moving forward from the liberalisation stage, Gómez-Barroso and Feijó. named the next stage of telecommunciations development an '*information society promotion stage*', in which, many changes have taken place – open markets, convergence of economic/political ideologies, speeding-up of the technological advances, de-centralisation of political decision-making, economic and geopolitical instability and, especially, a change of economic paradigm – from an industrial age to an information age.[11] This change of paradigm becomes the key for the future of the telecommunications industry. Almost all countries have their own proposals for adapting their economies to the new socioeconomic realities. In these plans, 'universal access' to advanced telecommunications services is given a high priority.[12] Generally speaking, it is assumed that private companies will carry out most of the tasks required to reach this objective. In spite of that, the public sector has re-appeared, a fact that was unthinkable only ten years earlier.

Researchers defined the role of the public sector in this information promotion stage as:

> *"an indirect actor, encouraging demand, or backing the activity of the private actors in specific areas and under certain conditions. … The current stage provides related extension of roles taken on by the public sector, gives more room for establishing new models for the relationship between the public and private sectors'.*[13]

The driving force behind this re-appearance of public involvement in telecommunications, as identified in a range of literature, is the economic crisis that took hold in a great number of countries during the second half of 2008, which has led to the reconsideration of public involvement and a possible better safeguard.[14] That also created a need, or rather room, to redefine the relationship between the free operation of the market and public intervention in commercial activities.

It becomes clear here that the wave of liberalisation in the 1970s–1980s established the idea that investment in telecommunications infrastructure should be left to the responsibility of commercial operators. As a direct result of this, the market force became a primary driver of the industry development. This idea has certainly not been abandoned in the current information stage, but the latest developments in putting public funds into the extension of broadband infrastructures could well be interpreted as a degree of distrust in the ability of market forces to deliver in terms of a universal broadband infrastructure and a universal access.[15] This then became an interesting situation seeing that the re-appearance of public engagement in the telecommunications is turning the other way round. Now, the issue here is using public funds in building out the broadband infrastructure in a sector which, to a large extent, has become privatised decades ago.[16]

Many controversial issues have emerged in this new trend such as what instrument should be utilised in carrying out this undertaking and what the ideal mix of public and private engagement should be. The answers to these questions led to a recent phenomenon, the forming of public–private partnerships (PPPs). In fact, different forms of PPPs have appeared to be a popular choice for many governments on this mission.

2.2. *The emergence of public–private partnerships (PPPs)*

It has been only in the past few years that the economic literature has approached public–private partnerships (PPPs) using contract theory and firm theory, viewing them as a way to avoid market and public failures while financing and operating public services.[17] Crucial factors in defining the success of PPPs have been drawn in some recent studies.[18] Some key factors include the need to (a) properly identify economic and social targets; (b) effectively match the resources and competences of the different partners; (c) design a network in line with the area's geographical constraints; and (d) define the expected demand and the services required. However, current studies have not been able to conclude that PPPs are an ideal instrument for public engagement in telecommunications. Furthermore, it is also worth noting that literature has shown that PPPs can

[10] Falch, M., & Henten, A. (2010). Public–private partnerships as a tool for stimulating investments in broadband. Telecommunications Policy, 34, 496–504.

[11] J.L. Gómez-Barroso & C. Feijó. (2010). A conceptual framework for public–private interplay in the telecommunications sector. Telecommunications Policy, 34, 487–495.

[12] See Feijó., C. G. m.-B., J. L., & Rojo Alonso, D.,. (2006). European competition law in the electronic communications sector: Evolution and critical analysis. Annals of Telecommunications, 61(7/8), 842–859. Also see, J.L. Gómez-Barroso & C. Feijó. (2010). A conceptual framework for public–private interplay in the telecommunications sector. *Telecommunications Policy*, 34, 487–495.

[13] Ibid.

[14] Cove, M., & Martin, I. (2010). Motives and means for public investment in nationwide next generation networks. Telecommunications Policy, 34(505–512). Also see, Falch, M., & Henten, A. (2010). Public–private partnerships as a tool for stimulating investments in broadband. Telecommunications Policy, 34, 496–504.

[15] Falch, M., & Henten, A. (2010). Public–private partnerships as a tool for stimulating investments in broadband. Telecommunications Policy, 34, 496–504.

[16] Ibid.

[17] Bennett, J., & Iossa, E. (2006). Delegation of contracting in the private provision of public services. Review of Industrial Organization, 29(1/2), 75–92. Also see, Guasch, L., Laffont, J., & Straund, S. (2006). Renegotiation of concession contracts: A theoretical approach. Review of Industrial Organization, 29(1/2), 55–73.

[18] Picot, A., & Wernick, C. (2007). The role of Government in broadband access. Telecommunications Policy, 31(10/11), 660–674. Also see, Ucciarelli, A., Sadowski, B. M., & Achard, P. O. (2010). Emerging models of public–private interplay for European broadband access: Evidence from the Netherlands and Italy. Telecommunications Policy, 34, 513–527.

sometimes lead to failures, which are partly rooted in the dynamics of its business structure.[19]

Technically, the form of PPPs has significant impact on public and private funding at different stages of the target project, that makes the choice of technology becomes a core matter and conditions the time horizon of the investment (and the alignment of partnerships along this horizon). For example, in building broadband infrastructure, a fibre technology solution (e.g. Fibre-to-the-Home) implies a more investment-intensive project and has a longer payback period compared to other technological options such as the wireless network. Thus, although both wired and wireless technologies are scalable, the fibre network does allow for greater bandwidth capacity.[20]

A number of countries adopted PPPs in building their NGNs, first and foremost, Australia and New Zealand; but the same goes for the Obama administration in the US and many EU countries. PPPs are particularly popular in the deployment of broadband services in rural areas, where many regional authorities take matters into their own hands and partner with various groups – including technology companies, alternative operators, utility companies and even local building authorities – to deliver rural broadband initiatives. For example, Alcatel-Lucent has worked with the regional community of Sasbachwalden in Germany to build an open-access FttH (fibre-to-the-home) network to bring 100 Mbps services to the area's 1500 homes.[21] Sweden is also full of similar initiatives, with the national regulator indicating that there were over 150 local networks, owning around 30 per cent of the total national fibre infrastructure by 2009. In April 2011, Fujitsu announced that it planned to invest around $3 billion to build an open-access wholesale FttH network that will cover rural regions, delivering 1 Gbps upstream and downstream to users in the UK. This project will utilise UK government funding together with the company's private funds. Fujitsu has also indicated that they expect to cover five million homes and businesses, potentially as early as 2015.[22]

Nevertheless, as a newly emerged phenomenon, PPPs in telecommunications is yet to be tested out broadly. Researchers pointed out that:

> *'public-private partnering in telecommunications confronts a number of significant hurdles, both generic and domain-specific. Economic-legal challenges include conditions for direct public intervention, potential distortions of competition and "crowding-out" of private investments. A second group of difficulties are those related to the framework needed for these partnerships to thrive'*.[23]

As the most ambitious project in building next generation broadband infrastructure, the current NBN project in Australia presents a valuable example for the world at large. PPPs are to be used in many construction projects with private operators while the NBN Co. remains a wholly-owned government company. Building on the above assertions, the following parts of this paper will examine the NBN project in Australia in detail with an overall aim to highlight the various challenges that this particular project has encountered to date.

3. An introduction to the Australia National Broadband Network project

In March 2007, the Australian Labor Party announced the NBN plan to promote broadband economy. New investment in broadband was said to be "*one of the most critical areas of infrastructure*" and the Labor Party's view was that government can play a role "*in delivering broadband investments to secure Australia's future economic prosperity*".[24]

After several amendments, the current government NBN proposal was formally announced in 2009, which promised a new network to be built in partnership with the private sector and that would be "*the single largest nation building infrastructure project in Australian history*".[25] In particular, the NBN plan would "*invest up to $43 billion over 8 years to build the national broadband network*" and it would support 25,000 jobs every year, on average, over the life of the project and at its peak would support 37,000 jobs".[26] The government also claimed that the full benefits in terms of productivity associated with the investment would continue to flow for decades beyond the completion of the project.[27]

The rollout plan was carried out immediately after the NBN announcement. A company titled NBN Co. was formed in April 2009 to carry out this mission. It was established to be a Commonwealth wholly-owned company represented by two "Shareholder Ministers" – the Minister for Broadband, Communications and the Digital Economy and the Minister of Finance and Deregulation.[28]

[19] Ucciarelli, A., Sadowski, B. M., & Achard, P. O. (2010). Emerging models of public–private interplay for European broadband access: Evidence from the Netherlands and Italy. Telecommunications Policy, 34, 513–527.

[20] OECD. (2008). Developments in fibre technologies and investment. Working party on Communication Infrastructures and Services Policy. Retrieved 13 April, 2011, from http://www.oecd.org/dataoecd/49/8/40390735.pdf.

[21] Alcatel-Lucent. (2010). Alcatel-Lucent deploying 100 Mbps GPON FttH in Sasbachwalden. Fibre Optics Weekly Update 30(27), 4.

[22] Fujitsu. (2011). Fujitsu unveils plans to bring fibre to 5 million homes and businesses in rural Britain. Retrieved 15 April, 2011, from http://www.fujitsu.com/uk/news/pr/fs_20110413.html

[23] J.L. Gómez-Barroso & C. Feijó. (2010). A conceptual framework for public–private interplay in the telecommunications sector. Telecommunications Policy, 34, 487–495.

[24] Conroy, S. (2007). Australian Labor Party (ALP) NBN Announcement. Canberra: Minister of Broadband, Communications and Digital Economy.

[25] Conroy, S. (2009). New National Broadband Network. Minister for Broadband, Communications and the Digital Economy. Retrieved from http://www.minister.dbcde.gov.au/media/media_releases/2009/02

[26] Conroy, S. (2009). Historic reforms to telecommunications regulation. Retrieved from http://www.minister.dbcde.gov.au/media/media_releases/2009/088

[27] Conroy, S. (2009). New National Broadband Network. Minister for Broadband, Communications and the Digital Economy. Retrieved from http://www.minister.dbcde.gov.au/media/media_releases/2009/02.

[28] Ibid.

A comprehensive study to determine the operating arrangements, detailed network design, ways to attract private sector investment for rollout and ways to provide procurement opportunities for local businesses was commenced in early 2010. In addition, legislative changes were made from 1 July 2010 that governs the NBN Co. and facilitates the rollout of fibre networks, including the requirement of using Fibre-to-the-Premises (FTTP) technology in the deployment. The initial investment of $4.7 billion was put into places consequently.

The Australian Labor government's election win in 2010 was at least partly due to its NBN policy. Labor's win indicated that the Australian people do understand the importance of the NBN as essential infrastructure for a range of social and economic developments. Passing of critical legislation and the release of the NBN Co. business plan took place following the election victory in 2010.

Although there were certainly queries on the budget throughout the whole process, it did not deter the majority of the elected parliamentarians from supporting the concept. The election and its focus on the NBN offered opportunities to fine-tune the plan, and some significant changes to its details have been made in March 2011.[29]

3.1. *Competition and regulations*

As being the incumbent telecom player in Australia, Telstra owned majority of the telecommunications infrastructure in the country. Telstra has been receiving complaints from its industry rivals and the consumers for lack of accessibility and the monopolistic service pricing for years.[30]

As promised by the NBN proposal, the introduction of the NBN will change the current industry landscape for good. While there will be a transition period where some of the old will remain, activities will increasingly move to the new environment with '*a level playing field*'[31] for all the telecom players created by the government owned wholesale only company, the NBN Co.

The ownership issue of the infrastructure by the incumbent player is said to be solved and the wholesale price of the NBN Co. will be decided by the regulators with an aim to create fair competition to all the industry players. This in itself will see the players starting to realign themselves, and in preparation for the new world many will start changing their business plans well before that time.

Nevertheless, the Australian government has published a far-reaching regulatory regime that left no doubt that there was no way back to the old days where the incumbent was able to manipulate the regime. That indicates the single most important role of the NBN – providing certainty for the industry about future direction. In the end the outcome of the new framework will be aligned with the goals of the NBN. There have been problems and the outcome is not guaranteed either, but for the first time individual companies will be far more responsible for their own business rather than leaving the final decision-making to the incumbent. It is important to note that these changes will take some time to arrive and there will be a transition period where all the parties (NBN Co. incumbent and other telecom companies) will have to cooperate: this will definitely require give and take.

Moreover, it was also interesting seeing that the incumbent (Telstra) realised that change was inevitable soon after the NBN was announced and it reacted swiftly. A new management team was appointed, led by the new CEO, David Thodey. Telstra declared its support for the NBN plan and its willingness to work with the government. The company also put its weight behind the trans-sector concept, which will be the conduit to new revenue. Negotiations between Telstra and NBN had been tough but a Heads-of-Agreement was signed in June 2010 and support for the government's regulatory reforms followed in October last year.[32] In June 2011, Telstra finally signed Definitive Agreements with NBN Co and the Commonwealth confirming and committing to its participation in the rollout of the NBN. The agreements still hinge on whether the Australian Competition and Consumer Commission (ACCC) accept Telstra's structural separation and approve the associated migration plan.[33] In addition, the AUD$11 billion worth Definitive Agreements required majority approval of Telstra's shareholders. The vote was overwhelmingly in favour at Telstra's Annual General Meeting, held in Sydney on 18 October, 2011.

3.2. *The deployment*

With such a high-level public investment, political activities will no doubts involved in the NBN process. Although there is an extremely business-like approach designed into the project with NBN Co., elections, ministers and government policies all had a crucial influence on the NBN plan.

To date, two large-scale projects have been singled out to form a tangible start to the rollout before a full national launch. Tasmania became the first state where the rollout commenced in 2009.[34] The start of the new regional backbone network and the building of five test sites on the mainland

[29] Australian Federal Parliament. (2011). Journals of the Senate Canberra: Australian Federal Parliament Retrieved from http://parlinfo.aph.gov.au/parlInfo/download/chamber/journals/20110324_SJ027/toc_pdf/jnlp_027.pdf;fileType=application%2Fpdf#search=%22national%20broadband%20network%22.

[30] AAP. (2009, 23 Oct). Telcos urge Telstra break-up, Herald Sun. Retrieved from http://www.heraldsun.com.au/business/telcos-urge-telstra-break-up/story-e6frfh4f-1225790322564. Also see, AAP. (2009, 23 Oct.). Telstra records highest number of irate customers as complaints against the telecommunications industry soar, Herald Sun. Retrieved from http://www.heraldsun.com.au/news/telstra-records-highest-number-of-irate-customers-as-complaints-against-the-telecommunications-industry-soar/story-e6frf7jo-1225790407922.

[31] Conroy, S. (2009). Historic reforms to telecommunications regulation. Retrieved from http://www.minister.dbcde.gov.au/media/media_releases/2009/088 .

[32] Telstra. (2010, 20 June). Telstra signs Financial Heads of Agreement on NBN. Retrieved 1 Sept., 2010, from http://www.telstra.com.au/abouttelstra/media-centre/announcements/telstra-signs-financial-heads-of-agreement-on-nbn-1.xml .

[33] Conroy, S. (2011). Government - Telstra - NBN Co deal Delivers Historic Telecommunications Reform. Sydney: Minister for Broadband, Communications and the Digital Economy Retrieved from http://www.minister.dbcde.gov.au/media/media_releases/2011/203.

[34] Conroy, S. (2009). Tasmania first to receive superfast broadband. Canberra: Minister for Broadband, Communications and the Digital Economy Retrieved from http://www.minister.dbcde.gov.au/media/media_releases/2009/023.

consequently started in mid-2010 have increased to over 31 sites during 2011.

The government released an NBN Implementation Study in 2010, prepared by McKinsey & Company/KPMG.[35] The Implementation Study examines the government's coverage, commerciality and competition objectives as well as detailed operating arrangements for NBN Co., its ownership and structure, ways to attract private sector investment and longer term privatisation. The government also released the Statement of Expectations, which comprises the government's response to the Implementation Study, and clearly sets out the government's expectations of NBN Co. as the rollout instrument.

March 2011 saw the passage of the NBN Access Bill and the NBN Companies Bill by the Australian Federal Parliament. The passage overcame a few hurdles during the parliamentary debates stage. As a result, a number of key amendments were accommodated. A clear restriction was placed to protect the NBN's competitive advantages, that is, protecting against ISPs implementing their own high-speed Internet network to undercut the NBN prior to the NBN's rollout. Other key amendments included the removal of NBN Co.'s powers for price discrimination so that they can only discriminate against those retail service providers where they are not creditworthy. In addition, NBN Co.'s power to enforce the bundling of voice services was also removed.

It is important to note that, at the point of writing this article, the NBN project in Australia is still ongoing and remains at an early stage. Substantial deployment in the mainland is yet to fully commence and many details will need to be refined in the course of the rollout. Nevertheless, the early experience will be vital to the success of this project and will also offer a valuable reference point for other countries as they develop their own broadband policy in a similar or different way. The remainder of this article therefore highlights the various challenges that the Australia's NBN project has encountered or is currently facing.

4. The broadband challenges

Establishing an exclusive nationwide wholesale telecommunications company as big as NBN Co. in Australia warrants a huge amount of debate and investigation. *Prima facie*, this initiative goes against the well-established competition rule of the market economy, to promote a fair opportunity for enterprises to compete in the market place and not develop dominating market powers.[36] While in Australia, NBN Co. was established to have the legalised exclusive market power as a wholesale telecoms company. Many significant implications arise from its special status. This part of the paper will focus on four particular aspects of the NBN project and highlight the associated challenges.

4.1. *A challenge to increase transparency and balance government oversight*

Having a government owned enterprise to build the national wide fibre network by using billions of taxpayers money will, no doubt, require an ultimate level of transparency for the entire course of the project. On this aspect, the Australian NBN project has received criticism for lack of transparency several times since its commencement in 2009. The most recent instance was comment from the CEO of Optus (Australia), Mr. O'Sullivan.[37]

Mr. O'Sullivan called for the establishment of an independent body whose functionality will parallel that of the Reserve Bank of Australia, to provide oversight for the NBN. He also requested that Australians be given full view of the deal between NBN Co and the incumbent (Telstra) relating to its structural separation and called for a competitive tender process to be held for the operation and management of the NBN. In particular, Mr. O'Sullivan described the proposed independent body as:

> *"a body that would sit independently from government and would be tasked with ensuring that the NBN is run to a well defined set of criteria all aimed at managing the NBN in the best interests of its customers, not of the government of the day, nor of any political agenda, or indeed the NBN Co's executives. … It could be tendered out on a state or national basis with contracts renewed every three, five or seven years, but they would be renewed on the quality of service and the efficiency of each of these operators."*[38]

His voice is clear and strong here – the NBN needs a separate layer of oversight to ensure the level of transparency it should have, which represents a logical concern of the industry and general public.

However, on the other side, the newly established NBN Co. has been advancing the need to strike a balance between government intervention and letting NBN Co. make its own decisions, in order to obtain favourable financial and investment outcomes. The NBN Co. chief executive Mr. Quigley recently claimed that the NBN is at risk of being "*over-scrutinised*".[39]

These contradictory claims highlighted the first challenge here, that is: *what the right mix of government intervention and pure business decision-making in running the publically funded monopoly telecom company should be*. The answer is yet to emerge in Australia at this stage, and the answer will definitely vary in different jurisdictions, depending on the political and social-cultural factors. This issue should, however, be

[35] DBCDE. (2010). National Broadband Network Implementation Study. Canberra: Department of Broadband Communications and Digital Economy Retrieved from http://www.dbcde.gov.au/broadband/national_broadband_network/national_broadband_network_implementation_study.

[36] Taylor, M. (2006). International competition law: a new dimension for the WTO? Cambridge: Cambridge University Press.

[37] Optus is currently the second largest telecommunications company in Australia.

[38] Optus chief calls for more NBN oversight. (2011). Business Spectator. Retrieved from http://www.businessspectator.com.au/bs.nsf/Article/Optus-chief-wants-more-NBN-oversight-pd20110227-EG7NB?opendocument&src=rss.

[39] Herrick, C. (2011). NBN Co's Quigley questions Government oversight methods. Retrieved 2 April, 2011, from http://www.cio.com.au/article/380829/nbn_co_quigley_questions_Government_oversight_methods/

an important question to ask right at the planning stage of a project as big as NBN in Australia.

Nevertheless, the federal Communications Minister Stephen Conroy has responded by confirming that the NBN project is not burdened by a dysfunctional level of bureaucratic oversight.[40] Consequently, in March 2011, the federal government agreed to subject the NBN to another layer of scrutiny by a joint parliamentary inquiry with a wide variety of memberships drawn from both the House of Representatives and the Senate.[41] This joint parliamentary committee will hear not only from public servants, but also from private sector witnesses to establish the cost effectiveness of the NBN rollout. Nonetheless, other requests designed to reveal the full negotiation between NBN and Telstra as well as establish an open tender process for the operation and management of the NBN has somehow been ignored by the government.

4.2. *A challenge to find the right combination of using fibre and wireless technologies*

As promised by the current NBN plan, 93 per cent of Australia will be connected to the high-speed optical fibre networks at the completion of the project. The networks will offer a superfast connection speed of up to 1 gigabit per second (Gbps) and 100 megabits per second (Mbps) initially after launch. Coming along with these promises is the question whether such increase in networking speeds justifies the AUD$36 billion price tag of the NBN and whether Australians need the 1 Gbps speed for day-to-day internet usage.

Strong arguments have been put forward that there exists an alternative to the planned nationwide fibre network such as a comprehensive wireless network (utilising next generation wireless technologies).[42] Competition from such next generation wireless technologies could affect the adoption forecasts of the NBN that:

> *"trends towards 'mobile-centric' broadband networks could also have significant long-term implications for NBN Co's fibre offerings, to the extent that some consumers may be willing to sacrifice higher-speed fibre transmissions for the convenience of mobile platforms".*[43]

However, the NBN business plan assumes that fixed-wireless substitution is virtually non-existent, with wireless-only households growing from the current 13 per cent to no more than 16.4 per cent in 2040. Given the plan assumes that this rate will reach 15 per cent by 2015, the business plan hinges on minimal growth of wireless-only subscribers over 30 years.[44]

In fact, as it currently stands, the argument should really be about the mix of wireless and fibre technologies in the NBN plan, not whether one technology is superior to the other. The two technologies will undoubtedly exist in the future as complementary offerings[45] i.e. a nationwide wireless network operating alongside the fibre component of the NBN.[46] The argument therefore is that, when the time comes, a fibre network covering 93 per cent of the population may not be justifiable due to its high cost in comparison to the NBN's international peers, especially given that the (FttH) component of the NBN is really only reaching cities and certain metropolitan areas and not the entire country.

Examples were added into this argument, including countries which have plans to introduce high-speed broadband networks such as the United States and India which have been encouraging a national wireless broadband rollout. US President Barack Obama announced a US$11 billion government funded national wireless broadband public safety network and India is aiming to facilitate a variety of technologies such as FttH, FttC and wireless technologies such as CDMA EV-DO, WiMAX, HSPA and 4 G LTE.[47]

The current situation in Australia is altering the technology mix between fibre and wireless. This could jeopardise the government's claim that the project should remain off budget as a commercial investment. This could also deliver an unfavourable political outcome for the government, even if a better technical outcome can be achieved because, after all, the NBN represents not only a pure business decision but also, more importantly, a political agenda. Such political issues are discussed in more depth in section 4.3.

As the result, it remains to be seen whether the 93 per cent national fibre coverage is a right choice representing a true need of the Australian public and economy, or just an expensive tool design to help the political party win the next national election. Unfortunately, the price will be too high to bear for the nation if it is proved to be a mistake. That brings out the second challenge in policymaking, *what is the right combination of fibre technology and other alternatives?* Although this challenge is definitely another issue subject to various

[40] Conroy defends NBN scrutiny: report. (2011). Business Spectator. Retrieved from http://www.businessspectator.com.au/bs.nsf/Article/Conroy-defends-NBN-scrutiny-report-pd20110223-ECR6M?opendocument&src=rss.

[41] Oakeshott to head NBN inquiry. (2011). Business Spectator. Retrieved from http://www.businessspectator.com.au/bs.nsf/Article/Oakeshott-to-head-NBN-inquiry-EJDVC?OpenDocument&emcontent_nbn.

[42] Examples of such networks include 4G Long Term Evolution (LTE) networking employed by telecommunications companies such as Verizon Wireless in the US, Worldwide Interoperability for Microwave Access (WiMAX) offered by companies such as Sprint Nextel in the US, and High Speed Packet Access (HSPA/HSPA+) networking offered by companies such as Telstra (HSPA+) in Australia and AT&T (HSDPA/HSUPA) in the US.

[43] NBN at risk from wireless: report. (2011). Business Spectator. Retrieved from http://www.businessspectator.com.au/bs.nsf/Article/NBN-corporate-plan-is-reasonable-report-pd20110214-E36HC?opendocument&src=rss.

[44] Bringing NBN investment undone. (2011). Business Spectator. Retrieved from http://www.businessspectator.com.au/bs.nsf/Article/NBN-Co-business-case-wireless-Gillard-Yasi-pd20110204-DQVU4?OpenDocument&src=src.

[45] Ibid.

[46] Australian Federal Parliament. (2011). Journals of the Senate Retrieved from http://parlinfo.aph.gov.au/parlInfo/download/chamber/journals/20110324_SJ027/toc_pdf/jnlp_027.pdf;fileType=application%2Fpdf#search=%22national%20broadband%20network%22.

[47] Ibid.

factors such as the size of population and geographical condition of the country, a common principle can probably be drawn here. That is that the calculation of the mix needs to be carefully conducted before the decision is made, and the decision should primarily serve the true needs of the economy rather than something else.

4.3. *A challenge to ensure the objectives are clear and feasible*

As indicated above, using such an amount of public funds will guarantee the political characteristic of the project. This paper argues that the NBN policy in Australia is now serving several political agendas. Apart from subsidising regional broadband, two other major agendas are to reconstruct the incumbent telecom player, Telstra[48] and to utilise the yet-to-build fibre network as a national infrastructure for the digital economy with social and economic benefits in areas such as e-health, smart grids, e- government, education and e-commerce.[49]

The issue of the reconstruction of Telstra can be achieved through a process of structural separation called for by the NBN legislation. As Telstra holds a dominant position on the telecommunications market, the sooner the structural separation takes place the more competitive the telecommunications sector will be in the post-NBN market.[50] The structural separation of Telstra will involve progressive decommissioning and deactivation of Telstra's copper and HFC networks as the FTTP network is rolled out, utilisation of existing Telstra exchange space, utilisation of a significant volume of Telstra's existing ducts and conduits and access to dark fibre and managed services for backhaul (i.e. links between the core network and sub-networks). At this stage, it is pleasing to see that the definitive agreement between Telstra and NBN was achieved in June 2011. Although, as of November 2011, the final approval is still pending from ACCC following the Telstra's shareholder vote, this agreement no doubt signifies substantial restructuring for the country's incumbent provider in the new NBN era.

In comparison, the issue of viewing the NBN as a national infrastructure for the digital economy requires a more in depth discussion.

The Australian government has shown its intention for the NBN to be viewed as a national utility, although some argued that it is more of a project built primarily to gain financial returns on investments. Budde's recent article stands out in this discussion.[51] He proposed that, in reality, the true intentions for the NBN are a balance of the two, such that the NBN would be a utility that delivered a return of sorts on investment to the government. Nonetheless, the interests of NBN Co. and that of the federal government are somewhat misaligned. NBN Co.'s main agenda is to create the returns on investments as being a real business in the market place, whereas the government wants the NBN for its social and economic benefits that are not part of NBN Co.'s business model. Despite NBN Co.'s investment in building the high-speed communications network, a vital part of the government's agenda may be lost if priority attention is not paid to the social and economic benefits that the NBN can bring. This could be at risk since it is not in the interest of NBN Co. financially.

On this point, the Australian government should have made it clear how it envisages the business objective of NBN Co. aligning with NBN's social objectives prior to commencement of the rollout. Although the government reiterated that the NBN is a nation building exercise, it could have highlighted such an agenda more strongly by offering evidence of the aforementioned social and economic benefits in areas such as healthcare and education.

It is good to see more recently that the Australian government has now begun to address the under-representation of the social and economic benefits in the formulation of the design and regulation of the NBN. One such policy is the assignment of the portfolio of 'Digital Productivity' to the Minister for Broadband, Communications and the Digital Economy Mr. Stephen Conroy. With this portfolio, the minister can direct other government departments and organisations towards the NBN, which can be seen as a powerful method to ensure that the NBN will be used to achieve broader social and economic benefits.[52] Furthermore, the Labor government has also promised to either freeze or reduce retail prices for the NBN. To a certain extent these measures do represent the government's willingness to make the NBN a utility designed to serve the public as its primary goal. However, making the policy is one thing but carrying it out can be another story. The feasibility and the possible complications in carrying out these measures are yet to be tested. For example, despite the fact that the government has promised a flat retail price, the ISPs connecting with NBN will surely want to pass their wholesale price to the end users to achieve their commercial benefit. How the government keeps the control of this and creates a sound market place for commercial activities at the same time is another challenge yet to come.

Thus, a question stemming from the debate on political agendas becomes clear here: i.e. what is the primary objective of the NBN project? If its primarily aims is to serve the public as a utility, a challenge that the Australian government currently faces is: *how to balance the business objective to*

[48] Kohler, A. (2011). Automatons no more. Business Spectator. Retrieved from http://www.businessspectator.com.au/bs.nsf/Article/Julia-Gillard-Labor-carbon-NBN-broadband-politics-pd20110228-EGRR3?opendocument&src=rss.

[49] See Budde, P. (2010). The NBN's wires are crossed Retrieved 12 April, 2011, from http://www.businessspectator.com.au/bs.nsf/Article/NBN-Co-Stephen-Conroy-broadband-pd20110325-FAA4E?opendocument&src=rss. Also see, Gillard, J., Smith, S., & Conroy, S. (2011). Strengthening Australia's Digital Future. Retrieved from http://www.minister.dbcde.gov.au/media/media_releases/2011/151.

[50] The Allen Consulting Group. (2006). Structural separation of Telstra — why it is needed, and what can be done. Retrieved 5 May, 2008, from http://www.dbcde.gov.au/__data/assets/pdf_file/0009/71757/5._CCC_Allen_report_270607.pdf.

[51] Budde, P. (2011). The NBN's wires are crossed. Business Spectator. Retrieved from http://www.businessspectator.com.au/bs.nsf/Article/NBN-Co-Stephen-Conroy-broadband-pd20110325-FAA4E?opendocument&src=rss.

[52] Gillard, J., Smith, S., & Conroy, S. (2011). Strengthening Australia's Digital Future. Retrieved from http://www.minister.dbcde.gov.au/media/media_releases/2011/151.

maximise returns and the government's political agenda to benefit the general public at the same time. To answer this the government needs to come up with a sound justification for such a significant public spending in such a business-like activity with a much more detailed action plan and this plan needs to come early enough to avoid controversies and confusion among the industry and the public. Mere promises without implementation measures are unlikely to deliver effective outcomes. On the other hand, if NBN aims to bring commercial returns on government investment by serving the country as a utility (just as Budde proposed), the challenge here would be to *examine if these multi objectives could possibly be achieved in one undertaking; and if so, what the appropriate implementation measures are*. Again, the studies on these issues should have been done before the commencement of the project. Unfortunately, Australia presents a failed example in this regard.

4.4. *A challenge to set the right pricing model*

The pricing model is another vital part of the discussion. Many Internet service providers (ISPs) in Australia have raised concerns about the NBN's usage-based wholesale pricing model as outlined in the NBN business plan. The concerns come after research by ISPs showed that the ISPs would be held accountable for paying for the extra data traffic that consumers will generate.[53] In addition, the NBN estimates that 36 per cent of the network's revenue would come from the usage-based Connectivity Virtual Circuit (CVC) by the year 2040. Without such a usage-based wholesale pricing model, the NBN would be unlikely to generate sufficient revenue to keep it within budget.[54]

With the increased media consumption on the Internet and the fast increase in data usage in the current online culture, ISPs will be looking at passing costs of the usage-based CVC to consumers because there is virtually zero revenue that can be extracted from online media outlets such as 'YouTube'. The cost to consumers will further increase due to the increase in demand for online media because it will force many end users to adopt the expensive 250GB/month plan as opposed to the 50GB/month plan that the government has used to calculate the NBN's competitive pricing model.[55]

The increase in data traffic due to online media consumption has already been felt by ISPs in the United States due to inexpensive online media streaming solutions such as Netflix and Hulu which offer tens of millions of users the ability to stream an unlimited amount of high definition movies and TV shows to their computers and other multimedia devices such as iPhones and iPads. With this in mind, video streaming will undoubtedly be a driving force behind increasing Internet traffic in the near and distant future. Because the ISPs are unable to force the content providers to pay for the large capacity of data that they are using to transfer the digital content, consumers will be dealt the cost of the traffic if the government is to maintain the usage-based CVC pricing model.[56] This then raises the question of whether the government should subsidise the NBN to households at the expense of billions of dollars of taxpayer funds.

Those who believe that the NBN will propel Australia's digital economy into the post-NBN era, justify taxpayer funding for the project on this ground. However, those who believe that the NBN will predominantly be used for online media consumption fail to see this argument, which the government is emphasising is a commercial investment whose viability is based on usage-based revenue. This is because if the content providers such as YouTube are not charged for their high volume of Internet traffic, the cost will undoubtedly fall on consumers, which will result in a heavy reduction in data usage.[57]

The Australian government's usage-based wholesale pricing model is thus questionable and it is hard to strike a balance between profitability and consumer benefit. If the government were to maintain such a model, then the benefit to consumers of such a high-speed broadband infrastructure will diminish and ultimately lead to a reduction in revenue and return on investment that NBN Co. is hoping for. So the challenge here is for the Australian government to work out an alternative or a replacement pricing model, which can only be done after the NBN objective is made clearer as discussed in section 4.3 above.

Moreover, an associated challenge relating to the pricing model appeared on the decision of Points of Interconnect (POIs). The decision on POIs is important because the location and number of POIs will affect a number of markets, including markets for transmission services and downstream markets at both retail and wholesale level. The POIs-related decision-making in Australia is not yet concluded at the time of writing this article. The process however provides valuable experience.

In October 2010, NBN Co. proposed 14 POIs to the national competition regulator, the Australia Competition Consumer Commission (ACCC).[58] Two month later, NBN Co. proposed to ACCC again on the same matter, but this time, a 120 POIs plan was proposed, which was shortly increased to 121 POIs in total.[59] This sharp increase in the number of POIs by NBN Co. came with many deep implications.

[53] Harris, A. (2011). Approaching NBN breaking point. Business Spectator. Retrieved from http://www.businessspectator.com.au/bs.nsf/Article/Optus-Internode-NBN-Gillard-Conroy-pd20110323-F877H?opendocument.

[54] Harris, A. (2011). Bringing NBN investment undone. Retrieved 13 April, 2011, from http://www.businessspectator.com.au/bs.nsf/Article/NBN-Co-business-case-wireless-Gillard-Yasi-pd20110204-DQVU4?OpenDocument&src=srch.

[55] See Harris, A. (2011). Approaching NBN breaking point. Business Spectator. Retrieved from http://www.businessspectator.com.au/bs.nsf/Article/Optus-Internode-NBN-Gillard-Conroy-pd20110323-F877H?opendocument. Also see, Hackett, S. (2011). Internode's NBN Pricing Pressure. Retrieved 22 June, 2011, from http://www.businessspectator.com.au/bs.nsf/Article/Internode-NBN-Telstra-ISP-RSP-points-of-interconne-pd20110721-JYB9B?opendocument&src=idp&emcontent_nb.

[56] Harris, A. (2011). Bringing NBN investment undone. Retrieved 13 April, 2011, from http://www.businessspectator.com.au/bs.nsf/Article/NBN-Co-business-case-wireless-Gillard-Yasi-pd20110204-DQVU4?OpenDocument&src=srch.

[57] Ibid.

[58] ACCC. (2010). An ACCC Discussion Paper on points of interconnect to the National Broadband Network. Retrieved from http://www.accc.gov.au/content/index.phtml/itemId/952292.

[59] ACCC. (2011). NBN Points of Interconnect. Retrieved from http://www.accc.gov.au/content/index.phtml/itemId/952292.

Firstly, backhaul costs from 121 points of interconnect back to the metro core of each retail service provider (RSP) will cost a lot of money. The ACCC have determined that this money will necessarily be added on to retail service costs once NBN Co. starts to force its RSP's to move away from the current 'temporary' points of interconnect (in metro capital cities) and make them re-connect at the geographically distributed POI locations. This cost will no doubt drive up the subsequent retail pricing. Secondly, the costs to reach POI's that are more distant will be higher than the costs to reach POI's distributed within a major capital city area. That means that it will cost more to service a regional customer. That in turn is what will work negatively against the federal government promise of uniform national retail pricing. In a competitive industry, since there will be no fixed line alternative to the NBN, pressures on retail pricing in metro areas will make it unreasonable to expect retail service providers to drive their metro pricing yet higher in order to cross-subsidise the rural areas.

This cross subsidy was inherent in, and automatic by design, in the 14 POI model. Third, the overheads created per CVC that have been previously noted are made substantially worse by this decision. CVC's will be far less likely to be efficiently filled by RSPs because the 121 POI decision slices up the country geographically in a manner that mitigates against efficiently utilising high capacities in each CVC. By splitting up the customer base in this manner, it makes it more likely that part filled CVC's will remain part filled and hence will cost more to operate. One additional technical side effect of this model is that the network will be less reliable. That is because the 121 POI's are separate, and if the single attachment point to one POI fails (e.g. due to a natural disaster), there is no way for services to be transparently switched-over via another POI. Back in the 14 POI model, there was the capability to have one of the two metro core POI's fail, and to have all customer services transparently switched to the backup POI. This all disappears in the name of progress in the 121 POI model.[60]

In addition, POIs raise an issue relating to the building of network protection. Many operators in Australia are currently providing Internet services without protection in any part of the access network, but most Telstra PSTN voice services are built with significant protection within the network. By moving over to a large number of POIs the opportunity to build effective protection will likely to be lost due to the financial restraints upon the companies involved. In the event of significant natural or unnatural disasters, there is a possibility that hundreds of thousands of network users will be left without any fixed line service at all. After mobile operators shift their backhaul traffic to the NBN, mobile services are likely to be disabled as well in the situation like this. However, it is important to note that Telstra gains a huge economic advantage on a permanent basis from the 121 POI model. That is simply because it owns the fibre connection to every POI already, and almost every POI is likely to be inside or right beside a Telstra owned exchange building.

Nonetheless, establishing an appropriate pricing model is the key to gaining the projected result. Although this issue might look more like a commercial decision depending on the judgements of economists, it is in fact a challenge for the policy makers to set the right benchmark between promoting business and maintaining an appropriate level of competition in the industry. The NBN's response to this challenge is yet to conclude.

5. Conclusion

Telecommunications companies, governments and regulators around the world are grappling with the challenges of investing in the next generation networks. Convinced by the scale of the economic and social benefits, frustrated by the pace of investment under existing regulatory structures, attracted by the apparent progress made in places like Korea and Japan where industrial policy has been vigorously pursued, some governments have contemplated sharp changes to the policies of the last two decades.[61]

The plan promoted by the Australian government to invest in fibre access networks reaching 93 per cent Australian by 2020 has a far-reaching impact on the country's long-term development. Moreover, it reflects the current enthusiasm for public spending on infrastructure in response to the global economic downturn. It also brings back an old notion of public investment in telecommunications although the investment model now might be different.

The NBN project in Australia has battled through many obstacles to reach its current status. However, the NBN project is still an ongoing concern attracting media debates on a daily basis. Academics, politicians, industry stakeholders, regulators and other experts are all claiming that different things need to be done to make NBN work better. The proposed variations are all different from each other, as most of the individual alternatives are based on diverse fields of expertise, personal views and vested interests. So there is no or very little uniformity in these comments. The only possible agreement in these debates seems to be that changes are needed to the NBN plan. The choice for the Australian government is thus limited here – the government can choose to stop and re-think the plan with a view to making it a closer-to-perfect plan. However, that is probably never going to happen but will most likely result in significant delays. Alternatively, the government can choose to continue with the original plan and make changes as the project progresses, based on the conclusion that there is never going to be a 'perfect' plan. Apparently the second option has been adopted and this choice has inevitably led to consequences vis. that the ongoing changes, corrections and discussions have opened the door to the suggestion that the whole project is flawed.

[60] Hackett, S. (2011). Internode's NBN Pricing Pressure. Retrieved 22 June, 2011, from http://www.businessspectator.com.au/bs.nsf/Article/Internode-NBN-Telstra-ISP-RSP-points-of-interconne-pd20110721-JYB9B?opendocument&src=idp&emcontent_nb

[61] Given, J. (2011). Take your partners: Public–private interplay in Australian and New Zealand plans for next generation broadband. Telecommunications Policy, 34, 540–549.

This paper has critically analysed the NBN project in Australia against recent literature on utilising public spending in broadband infrastructure. Four challenges that the current NBN deployment in Australia encountered are highlighted. Although the success or failure of this project will eventually be judged by international comparisons of the availability, speed and price of services, it is important to carefully evaluate every step of such a significant project so the experience can be shared and lessons can be learnt.

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