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The Parliament of the Commonwealth of Australia

# Broadening the debate

**Inquiry into the role and potential of the National Broadband Network**

House of Representatives  
Standing Committee on Infrastructure and Communications

August 2011  
Canberra

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# Contents

Chair's foreword .....	ix
Membership of the Committee .....	xi
Committee Secretariat.....	xi
Terms of reference .....	xiii
Background and recommendations .....	xv
<b>1 Introduction .....</b>	<b>1</b>
Scope and conduct of the inquiry .....	1
Structure of the report .....	2

## **PART ONE    IMPACTS**

<b>2 Government services.....</b>	<b>7</b>
Current services.....	7
Services under development and future services.....	9
Efficiency in service delivery .....	11
Efficiency in government operations .....	13
Gov 2.0 .....	18
Committee conclusions.....	21
<b>3 Health .....</b>	<b>23</b>
Why is e-health important? .....	24
Tele-health applications .....	27
Remote consultations, diagnostics and treatment.....	27
Electronic storage and transmission of medical data .....	32
In-home monitoring .....	35

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Rehabilitation and preventative health .....	38
Aged Care .....	40
Mental health .....	43
<b>Improved service in regional areas .....</b>	<b>45</b>
Health professional in regional areas .....	48
<b>E-health records .....</b>	<b>50</b>
<b>Medical education .....</b>	<b>52</b>
<b>Government leadership .....</b>	<b>54</b>
<b>Committee conclusions .....</b>	<b>57</b>
<b>4 Education .....</b>	<b>61</b>
<b>Enhanced classroom-based education .....</b>	<b>62</b>
More educational institutions connected .....	64
Richer online resources available .....	65
Remote linkage to experts and institutions .....	68
Sharing and interacting with other schools and campuses .....	72
Access to more curriculum options .....	73
Increasing student and teacher retention in rural areas .....	74
<b>Enhanced education outside the classroom .....</b>	<b>76</b>
The benefit of ubiquity .....	76
Richer, more interactive online educational services .....	77
Education at home .....	80
Education in the workplace .....	85
Education in the community .....	89
<b>A more efficient education system .....</b>	<b>92</b>
<b>Committee conclusions .....</b>	<b>94</b>
<b>5 Infrastructure and the environment .....</b>	<b>97</b>
<b>Reducing energy use and carbon emissions .....</b>	<b>98</b>
Direct energy savings through more efficient networks .....	99
Supporting green data centres and consolidated ICT provision .....	100
Reducing the costs of travel .....	101
Smart grids to reduce energy waste .....	104
<b>Managing infrastructure using sensor networks .....</b>	<b>108</b>

Intelligent Transport Systems (ITS)—reducing traffic congestion.....	108
Smart infrastructure to manage assets and water resources .....	110
Agricultural applications .....	114
Environmental monitoring applications.....	116
<b>More accessible spatial data, satellite and aerial observation services .....</b>	<b>117</b>
<b>Committee Conclusions .....</b>	<b>121</b>
<b>6 Economic development and diversification .....</b>	<b>123</b>
<b>Improving business efficiency.....</b>	<b>123</b>
Video-conferencing .....	123
Tele-working .....	125
Cloud computing .....	129
VOIP .....	131
<b>Supporting business growth.....</b>	<b>132</b>
Opportunities for high technology industries .....	133
Home-based businesses.....	137
Australia's geographic advantage .....	141
<b>NBN impacts for regional development .....</b>	<b>143</b>
Constraints on business by current service.....	144
Regional service hubs.....	146
Attracting and growing businesses.....	147
Economic diversification.....	148
Exporting to other markets .....	150
Supporting tourism .....	151
Supporting agriculture .....	154
<b>Committee conclusions.....</b>	<b>155</b>
<b>7 Research and innovation .....</b>	<b>157</b>
<b>ICT investment, innovation, R&amp;D and productivity improvement.....</b>	<b>157</b>
Attracting foreign ICT investment in Australia .....	161
<b>Research in more locations and improved collaboration.....</b>	<b>163</b>
Research in remote locations.....	166
Research collaboration .....	168
Increased public engagement in science .....	172

Promoting application development .....	175
Committee conclusions.....	179
<b>8 Community and social.....</b>	<b>181</b>
<b>Improving social inclusion and interaction .....</b>	<b>181</b>
Australians in rural and remote areas .....	185
Indigenous Australians.....	188
Older Australians.....	189
Australians with disabilities .....	192
Australians from culturally and linguistically diverse backgrounds .....	195
<b>Enabling new methods of community interaction .....</b>	<b>196</b>
<b>Improving work–life balance.....</b>	<b>198</b>
<b>New entertainment possibilities .....</b>	<b>199</b>
<b>Better access to arts and culture.....</b>	<b>201</b>
<b>Better access to information and digital media.....</b>	<b>205</b>
<b>Crime and safety considerations.....</b>	<b>209</b>
Committee conclusions.....	212
<b>PART TWO IMPLEMENTATION</b>	
<b>9 Network capacity and technology.....</b>	<b>217</b>
<b>Speed .....</b>	<b>218</b>
Drivers of demand for speed.....	219
Scalable and future-proof technology.....	221
Other broadband technologies.....	223
Beyond the NBN fibre footprint.....	226
International backhaul capacity.....	230
Symmetry.....	231
Ubiquity.....	233
Reliability.....	235
National wholesale arrangements .....	238
Committee conclusions.....	241
<b>10 Government coordination .....</b>	<b>245</b>
A national digital economy strategy.....	245

Leading by example.....	249
Regional development.....	253
<b>11 Encouraging uptake and developing skills .....</b>	<b>257</b>
Promoting ubiquitous connectivity .....	257
Opt-in or opt-out? .....	258
Engaging with consumers .....	260
Assisting disadvantaged groups.....	265
Outside the fibre footprint.....	269
Applications and content .....	273
Skills development.....	277
Digital Literacy.....	277
Professional ICT skills development .....	284
<b>Dissenting report—Mr Paul Neville MP, Mr Paul Fletcher MP, Mrs Jane Prentice MP .....</b>	<b>291</b>
<b>Appendix A – Background .....</b>	<b>343</b>
Current broadband services in Australia.....	343
DSL broadband.....	345
Wireless broadband .....	346
Other broadband technologies .....	347
Overview of the NBN.....	349
The NBN fibre roll out plan.....	354
<b>Appendix B – Glossary of Terms.....</b>	<b>361</b>
<b>Appendix C – Submissions .....</b>	<b>379</b>
<b>Appendix D – Exhibits .....</b>	<b>389</b>
<b>Appendix E – Public hearings.....</b>	<b>397</b>

## LIST OF BOX STUDIES

Box 2.1	Shared services for Victorian local governments .....	16
Box 2.2	Sample Twitter feed for the 2011 Census .....	20
Box 3.1	RIDES .....	29
Box 3.2	Grampians Rural Health Alliance .....	48
Box 3.3	Neuroscience Research Australia falls prevention software .....	55
Box 4.1	Trove.....	66
Box 4.2	The Hutchins School.....	69
Box 4.3	YouTube Symphony Orchestra.....	71
Box 4.4	Uni TV.....	91
Box 5.1	Smart Grid, Smart City.....	107
Box 5.2	NearMap .....	119
Box 6.1	A practical example of tele-working .....	129
Box 6.2	North Queensland Small Business Development Centre.....	140
Box 6.3	Rising Sun Pictures.....	142
Box 7.1	The Square Kilometre Array (SKA) .....	163
Box 7.2	Skynet.....	174
Box 7.3	The Institute for a Broadband-Enabled Society (IBES) .....	176
Box 8.1	Video Relay Interpreting .....	194
Box 8.2	Virtual Museum of the Pacific (VMP) Project .....	208

## LIST OF FIGURES

Figure A.1	Number of internet subscribers by connection type, all ISPs, 2006-2010.....	344
Figure A.2	NBN technologies.....	350
Figure A.3	Indicative coverage of NBN fibre, wireless and satellite services .....	351
Figure A.4	Indicative NBN infrastructure design: a typical Fibre Service Area (with POI) .....	352
Figure A.5	NBN first, second and third stage rollout sites in Tasmania.....	356
Figure A.6	NBN first release and RBBP locations on mainland Australia .....	357
Figure A.7	NBN Deployment Schedule to FY2021.....	358
Figure A.8	NBN Fibre Premises Passed Targets .....	358





## Chair's foreword

Over the last thirty years the way we live and work has been undergoing significant transformation as a result of a variety of technological developments. We've moved from rushing to the bank in our lunchbreak through the whole introduction of automatic teller machines to online banking. We've gone from lining up at the payphone in holiday destinations to the constant contact of mobiles and social networks. We rarely expect mail in the letterbox but constantly check our multiple email addresses. How we work and live has been transformed and there is no reason to consider that this won't continue at exponential rates over the next thirty years.

This report looks at the ways various sectors of government service delivery, economic and regional development and social and community activity can be enhanced and expanded as a result of the fibre-to-the premises infrastructure of the National Broadband Network.

The report is divided into two parts. Part One discusses the impacts of the NBN on the sectors identified in terms of reference a) to h) of the Minister's referral. Part Two discusses term of reference i) and a number of other overriding issues concerning the NBN's implementation that inquiry participants noted will need to be addressed in order to maximise the benefits outlined in Part One.

A key message the Committee received during the inquiry was that while the NBN will be enabling infrastructure for a range of social and economic benefits across all sectors, in order for the potential of the NBN to be maximised, further 'demand side' action is needed. Related to this, inquiry participants told the Committee that an overarching strategy is needed to outline the Government's goals for how the NBN will be used and how those goals can be delivered through demand side interventions.

The Committee welcomes the recently launched *National Digital Economy Strategy* and the cross-government approach that is being taken to its implementation. The Strategy goes a long way to addressing concerns raised during the inquiry about the Government's strategic direction on digital economy matters. The Committee

also welcomes the new government initiatives that are associated with the Strategy.


Many submissions to the Committee highlighted the opportunities for dealing with the 'tyranny of distance' that we face as a nation – both between our centres of population and in linking with the international community. Evidence was presented to the Committee about the ways in which developments such as on-line business activity, connected communities, tele-working and tele-commuting, remote video consultations and delivery modes, only now being imagined and developed, will change the way we are connected to each other and the world.

The external benefits of this progress also extend to greater productivity and efficiencies, including cost savings, across the economy; improved environmental outcomes and greater social inclusion. Many submissions and reports referenced by those giving evidence outlined some existing empirical evidence by individual companies and organisations of all of these forms of flow-on benefits.

Since the Federal Government announced its intention to proceed with the NBN as a principally fibre-to-the-premise (FTTP) network, much of the public debate has focussed on the cost of construction and the corporate plan and governance of NBN Co. While these are clearly important matters, it is also important to evaluate the practical impact that the NBN is likely to have on the Australian economy and society. In particular, Chapter Nine outlines the importance that speed, technological future-proofing, complementary technologies, symmetry, ubiquity and reliability play in the proposed infrastructure's capacity to deliver the transformations outlined in the earlier chapters.

This report seeks to contribute significantly to the national conversation by broadening the debate and the Committee greatly valued the many considered submissions made by many individuals, organisations and communities across the nation.

**Ms Sharon Bird MP**  
Chair



## Membership of the Committee

Chair Ms Sharon Bird MP

Deputy Chair Mr Paul Neville MP

Members Mr Paul Fletcher MP

Mr Robert Oakeshott MP

Mr Ed Husic MP

Mrs Jane Prentice MP

Mr Stephen Jones MP

Mr Mike Symon MP

## Committee Secretariat

Secretary Ms Julia Morris


Inquiry Secretaries Mr James Nelson

Mr Andrew McGowan

Researcher Mr Shane Armstrong

Administrative Support Ms Tamara Palmer





## Terms of reference

The Committee will examine the capacity of the National Broadband Network to contribute to:

- a) the delivery of government services and programs;
- b) achieving health outcomes;
- c) improving the educational resources and training available for teachers and students;
- d) the management of Australia's built and natural resources and environmental sustainability;
- e) impacting regional economic growth and employment opportunities;
- f) impacting business efficiencies and revenues, particularly for small and medium business, and Australia's export market;
- g) interaction with research and development and related innovation investments;
- h) facilitating community and social benefits; and
- i) the optimal capacity and technological requirements of a network to deliver these outcomes.





# Background and recommendations

Since the Federal Government announced its intention to proceed with the NBN as a principally fibre-to-the-premise (FTTP) network, much of the public debate has focussed on the cost of construction and the corporate plan and governance of NBN Co. While these are clearly important matters, it is also important to evaluate the practical impact that the NBN is likely to have on the Australian economy and society.

In this context, the Hon Anthony Albanese MP, Minister for Infrastructure and Transport, asked the Committee to inquire into the 'role and potential of the NBN' with respect to its capacity to contribute to government services, health, education, resource management, environmental sustainability, regional economic growth, business efficiencies, research and development, and community and social benefits. The Committee was also asked to consider the 'optimal capacity and technological requirements of a network to deliver these outcomes'.

This report is divided into two parts. Part One, consisting of Chapters 2 to 8, discusses the impacts of the NBN on the sectors identified in terms of reference a) to h). These chapters highlight a large number of applications that are enabled by the availability of ubiquitous fast broadband and the benefits that could result. Part Two, consisting of Chapters 9 to 11, focuses on the implementation of the NBN and discusses term of reference i) and a number of other overriding issues that inquiry participants noted will need to be addressed in order to maximise the benefits outlined in Part One. Part Two contains a number of recommendations for the Government, as listed below:

## Recommendation 1

That the Government continue to coordinate the implementation of the *National Digital Economy Strategy* across government, ensuring appropriate regulatory frameworks are in place and promoting a consistent trans-sector approach to supporting its goals.

#### Recommendation 2

That the Government require its departments to report against the goals identified in the *National Digital Economy Strategy* in their annual reports.

#### Recommendation 3

That the Government continues to implement broadband-enabled technologies into its own services and operations as a means of improving efficiency, as well as to encourage NBN uptake and utilisation.

#### Recommendation 4

That the Government continue to support strategically targeted pilot projects in cooperation with relevant industries and communities that model innovative applications of the NBN.

#### Recommendation 5

That the Government consider allocating resources to each Regional Development Australia committee to allow these bodies to provide enhanced local digital economy leadership. This leadership role should include identifying regional goals and implementing related strategies and programs.

#### Recommendation 6

That the Federal Government develop a comprehensive engagement strategy incorporating a range of approaches to promote the uptake of broadband and digital technologies during the NBN rollout.

#### Recommendation 7

That, recognising the important roles of public libraries and community centres, the Federal Government works in an appropriate capacity to implement a network of public access points connected to high speed NBN services in as many communities as possible.

#### Recommendation 8

That the Federal Government, with other organisations as appropriate, develop targeted programs for those currently disadvantaged by the digital divide to improve awareness of publicly available high-speed internet facilities, to improve access, and to promote the development of relevant skills.

#### Recommendation 9

That the Government provide continued support for organisations involved in the development of high speed broadband applications.



**Recommendation 10**

That the Government maintains regulatory support to encourage increased levels of research and innovation in the private sector and recognises the NBN's importance to the realisation of its innovation agenda.

**Recommendation 11**

That the Government develop a strategy for the digitisation of Australia's culturally and historically significant content.

**Recommendation 12**

That the Government facilitate discussions between representatives of key content industries and internet service providers to work towards an agreed framework for minimising online copyright theft.

**Recommendation 13**

That the Government provide further support for digital literacy programs, based on the Broadband for Seniors kiosk model, making use of existing resources such as libraries and not-for-profit groups where possible.

**Recommendation 14**

That the Government continue to support programs that equip small and medium enterprises with the knowledge and support they need to compete in the digital economy.

**Recommendation 15**

That the Government develop strategies for the collection and provision of data on workforce needs in the ICT sector into the future.

**Recommendation 16**

That the Government develop a long term strategy to up-skill and/or retrain the existing workforce and develop new training programs to address emerging skills gaps.



## Introduction

### Scope and conduct of the inquiry

- 1.1 The National Broadband Network (NBN) is Australia's largest ever infrastructure project. It will provide 'superfast broadband for all Australians, at affordable prices'<sup>1</sup>. It is being rolled out by a newly created, government-owned company, NBN Co, which is to operate as a 'wholesale only, open-access network provider'<sup>2</sup>.
- 1.2 Since the Government announced its intention to proceed with the NBN as a principally fibre-to-the-premises (FTTP) network, much of the debate has focussed on the cost of construction and the corporate plan and governance of NBN Co. While these are clearly important matters, it is also important to evaluate the practical impact that the NBN is likely to have on the Australian economy and society.
- 1.3 In this context, on 16 November 2010 the Hon Anthony Albanese MP, Minister for Infrastructure and Transport, asked the Committee to inquire into the 'role and potential of the NBN'. The Committee subsequently publicised the inquiry nationally, seeking written submissions by 25 February 2011.
- 1.4 The inquiry received 252 submissions (including 17 supplementary submissions) and 42 exhibits. Submissions were received from individuals and organisations in all states and territories, covering a good proportion of Australia's geographic area and all of the sub-points in the inquiry's terms of reference.

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1 McKinsey-KPMG, *National Broadband Network Implementation Study*, 2010, p. i.

2 McKinsey-KPMG, *National Broadband Network Implementation Study*, 2010, p. i.

- 1.5 The Committee held 15 public hearings around Australia, including five hearings in regional centres. In addition, the Committee held a site inspection at one of the NBN first release sites at Scottsdale in North East Tasmania, as well as inspections at Fetch TV, National ICT Australia, Google and the Telstra Experience Centre in Sydney, and the Institute for a Broadband Enabled Society in Melbourne.
- 1.6 Copies of submissions and public hearing transcripts available on the inquiry's website:  
<http://www.aph.gov.au/house/committee/ic/NBN/index.htm>.
- 1.7 Lists of submissions, exhibits and public hearing witnesses are provided at appendices C, D and E respectively.
- 1.8 Given the inquiry's terms of reference, issues around the NBN's governance and rollout are not covered in any detail in this report. These issues will be subject to ongoing scrutiny through the recently established Joint Committee on the National Broadband Network.
- 1.9 The Committee thanks all those individuals and organisations who participated in the inquiry. There was a very productive level of engagement from all involved. The collective evidence received has provided the Committee, and through the Committee, the Parliament, with an excellent insight into the 'role and potential of the NBN'.

## Structure of the report

- 1.10 The report is divided into two parts.
- 1.11 Part One, Chapters 2 to 8, looks at **impacts** of the NBN on several areas as identified in the terms of reference for the inquiry: government services; health; education; infrastructure and environment; economic development, including in regional Australia; research and innovation; and community and social aspects. These chapters highlight a large number of applications that are enabled by the availability of ubiquitous fast broadband and the benefits that could result.
- 1.12 Part Two, Chapters 9 to 11, focuses on aspects of the **implementation** of the NBN, including what can be done to maximise the benefits described in Part One. It examines overriding themes which applied across more than one sector, and which were reflected in evidence received from many inquiry participants, regardless of any sectoral focus. Chapter 9 looks at network capacity and technology, as defined by term of reference (i),

which asked the Committee to examine the optimal capacity and technological requirements of a broadband network to deliver benefits in the sectors listed in the terms of reference. Chapter 10 looks at government coordination, including consideration of the *National Digital Economy Strategy* and its impacts at a regional and local level. Chapter 11 looks at ways in which uptake of the NBN may be encouraged, which includes consideration of consumer engagement, assistance for disadvantaged groups and services for those who remain outside the 'fibre footprint'. It also addresses the development of applications, content and skills.

- 1.13 Included at Appendix A is background information on current broadband technology in Australia and an overview of the NBN plan. A glossary of terms is included at Appendix B.



# PART ONE





## Government services

- 2.1 As described by the Department of Finance and Deregulation (DOFD), 'ICT is a critical enabler of government and its administration, governance and delivery of services to citizens and business.'<sup>1</sup>
- 2.2 Broadband is an essential component of governments' use of ICT. Through its ubiquity, the NBN will enable government to deliver an increasing number of services online to an increasing number of people. Through its speed, the NBN will enable government to advance its online service offering by incorporating technologies that improve citizens' experiences.
- 2.3 This chapter examines the NBN's impact on government services and operations, but does not include the range of government services covered in other chapters (such as health, education and infrastructure management). The chapter will look at current e-government services in Australia and then look at how e-government services might be used in the future to improve efficiency and citizen engagement.

### Current services

- 2.4 In 2009, a survey conducted by the Australian Government Information Management Office (AGIMO) indicated that the internet is now the preferred method for Australians to make contact with government. The

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1 DOFD, *Submission 166*, p. [cover page].

survey also indicated that more people would interact with government online if the usability of services was improved.<sup>2</sup>

- 2.5 Supporting these findings, one of the key observations from the United Nation's (UN) 2010 *e-Government Survey* was that:

On-demand access to information, services and social networks on the Internet through a personal computer is no longer considered cutting-edge in developed regions but a norm that many people take for granted.<sup>3</sup>

- 2.6 The development and implementation of e-government services has important benefits, as noted by the Broadband Commission for Digital Development in its recent report *Broadband: A Platform for Progress*:

Easy access to information about government services and activities helps to improve accountability and the quality of the services that an administration provides ... In addition, by making it easier and cheaper to access information, broadband connectivity is becoming a key facilitator of good governance.<sup>4</sup>

- 2.7 Australia has made good progress to date in e-government services, as evidenced by our high ratings in the UN survey cited above. DOFD's submission notes that the survey ranks Australia:

... first in Connected Services, second in its e-participation index, fifth in online service development, and eighth in the world on its e-government development index overall.<sup>5</sup>

- 2.8 Despite this achievement, the Australian Information Industry Association (AIIA) suggested there is still significant room for improvement:

First generation e-government – the use of ICTs to improve access to public services, improve and increase transaction flows and interactions with citizens – has enabled government agencies to deliver better services and achieve a range of efficiencies. But despite over 15 years of intense investment and effort, with few exceptions, the way in which government services are delivered has not fundamentally changed. Citizens are still filling in forms, attending offices, receiving letters in the mail, compiling

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2 AGIMO, *Interacting with Government: Australian's use and satisfaction with e-government services*, December 2009, p. 5.

3 United Nations, *e-Government Survey 2010*, p. 3.

4 Broadband Commission for Digital Development, *Broadband: A Platform for Progress*, June 2011, p. 34.

5 DOFD, *Submission 166*, p. [1].

documents to prove who they are, liaising with multiple agencies, presenting the same information multiple times ...<sup>6</sup>

2.9 The DBCDE submission expressed similar sentiments:

... it remains the case that there are many transactions that still require the client to visit a government office. For the elderly, the disabled, families with young children and those living in regional and remote Australia, the need to travel to a shopfront can be difficult and inconvenient.<sup>7</sup>

2.10 As an example of this limitation, Centrelink – the most commonly cited service delivery agency during the inquiry – still conducts 62 per cent (69.5 million) of its transactions on-site.<sup>8</sup>

2.11 DOFD observed that many online services are less developed than they could be because of the poor broadband services on offer in many parts of Australia – particularly in regional and rural areas.<sup>9</sup>

2.12 This issue was described as the ‘lowest common denominator approach’ by Adult Learning Australia. While the example relates to education services, it applies equally to other government services:

Currently, around the country ... there are a range of technologies that are used to provide learning experiences and enhance social inclusion. However, each one is stymied by some participants having access to reasonably fast broadband and others having limited or no access ... excellent learning and engagement tools are not used or are used at the level that matches the internet speed of the user with the worst connection.<sup>10</sup>

## Services under development and future services

2.13 The Government’s *National Digital Economy Strategy* sets a goal that four in five Australians will choose to engage with government online by 2020.<sup>11</sup>

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6 AIIA, *Submission 184*, p. 4.

7 DBCDE, *Submission 215*, p. 8.

8 NICTA, *Submission 198*, p. 8.

9 DOFD, *Submission 166*, p. 2.

10 Adult Learning Australia, *Submission 163*, p. [1].

11 Australian Government, *National Digital Economy Strategy*, May 2011, p. 24.

- 2.14 However, as the UN explains in its 2010 e-Government Survey, 'e-services cannot substitute for traditional methods if citizens do not have ready access to the requisite infrastructure.'<sup>12</sup>
- 2.15 The submission of the Department of Human Services (DHS) outlines that the saturation of broadband across the community (usually referred to as ubiquity) is a significant factor for the delivery of e-government services.<sup>13</sup> The NBN will enable agencies, for the first time, to plan their online services knowing that all of their clients potentially have access to a high-quality level of broadband service.<sup>14</sup>
- 2.16 During the course of the inquiry the Committee heard about a range of new e-government services – some that are being developed and others that are simply envisaged as a concept. In most cases the services would require broadband speeds far beyond what is available to the majority of Australians with current infrastructure, but at speeds that will be available when the NBN is rolled out.
- 2.17 Unquestionably, the speed and ubiquity offered by the NBN presents significant opportunities for governments, but also significant challenges, as summarised by the AIIA:
- With demands for improved transparency and accountability of public administration, increased pressure for community involvement in decision-making processes, and heightened citizen expectations of service quality and convenience, nothing short of transformational change is required. The NBN provides exactly what is needed to achieve this. Not only does it provide the underpinning infrastructure but also a platform for the convergence of technologies, applications and innovation necessary to change existing service paradigms.<sup>15</sup>
- 2.18 Responding to a question at a public hearing about what is needed to take advantage of the opportunities, Ms Suzanne Roche, a Director of the AIIA, stated:
- To me it is culture. Centrelink is a very good example of this ... You have had 70 years of history of an organisation asking people to come in, stand in a queue, fill in a form, go home, bring in documentation ... After 70 years, getting people to change how

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12 United Nations, *e-Government Survey 2010*, p. 45.

13 DHS, *Submission 186*, p. 7.

14 DOFD, *Submission 166*, p. 2.

15 AIIA, *Submission 184*, p. 5.

they do something – and that is from the provider side as well as from the consumer side – is difficult ... We know that you cannot change behaviour overnight, but it is fundamentally what does need to change.<sup>16</sup>

- 2.19 As noted in the DOFD submission, AGIMO is attempting to lead this cultural change through strategic documents such as the *Declaration of Open Government*, the *Cloud Computing Strategic Direction Paper*, and the *Whole-of-Government Tele-working Policy*.<sup>17</sup>

## Efficiency in service delivery

- 2.20 The key reason for pursuing e-government service delivery is efficiency – whether it is achieved through less travelling and waiting time for citizens, less need for manual processing of data by government employees, or less need for agencies to maintain expensive service delivery shopfronts. These and other opportunities for efficiency in service delivery will be enhanced by the NBN.
- 2.21 DHS has overarching policy responsibility for the Federal Government's key service delivery agencies, including Medicare and Centrelink, and highlighted a range of areas where service delivery efficiencies could be achieved:
- The use of real-time interactions and web 2.0 technologies for interactions with customers including video-conferencing, chat rooms and collaborative online workspaces.
  - Enhanced ability to share and integrate information from across government and service providers. Customers would be able to utilise high bandwidth functionality including the ability to scan documents and present electronic evidence to support their interactions with the portfolio in real time. This can reduce the need for customers to attend offices in person which has benefits for particular customer and client cohorts.
  - Authenticated information could be passed between agencies in real time, with customer consent, obviating the need for customers to physically provide certain types of validating documents.
  - Active content that changes in real time based on the actions of the user allowing them to manage their own information, make claims, and identify and self assess eligibility. This includes tailoring the content to suit users' preferences, including their

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16 *Committee Hansard*, Canberra, 27 May 2011, p. 7.

17 DOFD, *Submission 166*, pp. 1-2.

preferred language, what services are included and how they like to share their information.

- Ability for substantial mobile applications to be enabled by NBN such as mobile phone applications and other ubiquitous computing.
- Increased broadband coverage can be leveraged to provide more targeted services, particularly for people who are geographically isolated. This includes any planned growth in new suburban areas where broadband infrastructure is built into the suburban landscape.<sup>18</sup>

2.22 While this list focuses on the opportunities for DHS agencies, the Committee considers that it applies equally across all levels of government.

2.23 Throughout the inquiry, video-based technologies were commonly cited as the key drivers of future use of bandwidth, and this is also true in relation to the future of government service delivery. CSIRO, using Centrelink as an example, highlighted what could be possible:

A network that provides broadband communications will make the provision of tele-presence service between government offices, homes and other public locations ... possible and readily available ...

Customers visiting a Centrelink office could talk with the expert for each specific customer case, anywhere in the country. Whilst this does not remove the need for the presence of the Centrelink officer, it does remove the need for the officer or the customer to travel, possibly substantial distances. It also allows people with different skills and experience to be connected to customers with particular needs anywhere in the network. The customer experience will be similar to having the customer and the service officer involved in a private face-to-face consultation. The involvement of an expert, regardless of the location, in solving the customer's problem will result in faster and better service quality.<sup>19</sup>

2.24 Continuing this theme, Regional Development Australia (RDA) Townsville and North West Queensland (among many other regional organisations) cited the potential importance of video-conferencing applications for isolated communities:

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18 DHS, *Submission 186*, p. 9.

19 CSIRO, *Submission 171*, p. 6.

High speed broadband will ensure greater equity across Australia's communities in regard to access to government services. Federal, state and local governments and communities will be able to communicate more readily using online services including web-based video-conferences, improving the reach, efficiency and productivity outcomes for governments and customers alike.<sup>20</sup>

- 2.25 The Department of Immigration and Citizenship (DIAC) described how greater availability of video-conferencing could assist its unique services:

Implementation of the NBN could enable professional (DIAC) services to be delivered from home. An example of this is the provision of interpreting services via video-conferencing in early NBN release sites across Australia. The high data speeds and reliability available through the NBN will enable interpreter services to be provided by video-conference, enabling body language and other nuances of behaviour to maximise comprehension and reduce miscommunication.<sup>21</sup>

- 2.26 The AIIA explained how government services might be delivered using even less conventional technologies:

Augmented reality tools (a live, direct or indirect view of a physical, real world environment augmented by computer generated sensory input such as sound or graphics) open the potential for new and innovative ways to deliver training, provide customer intervention and support emergency and outreach activities remotely. Without an NBN infrastructure the scope of application and benefits that can be achieved using these smart applications will be limited.<sup>22</sup>

## Efficiency in government operations

- 2.27 As well as driving efficiency in service delivery, the Committee considers that the NBN will drive efficiency in the day-to-day internal operations of government agencies, including through expanded utilisation of video-conferencing, cloud computing and tele-working.

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20 RDA Townsville and North West Queensland, *Submission 202*, p. 2.

21 DIAC, *Submission 214*, p. 2.

22 AIIA, *Submission 184*, p. 8.

## Video-conferencing

2.28 The most obvious area is through more extensive and effective use of video-conferencing.<sup>23</sup> Across federal, state and local governments, there is undoubtedly an enormous amount of money and time spent travelling for meetings. As the NBN is rolled out, and as the cost of the necessary equipment becomes less prohibitive, the viability of high-quality video-conferencing as a substitute for travel and face-to-face meetings will be enhanced.

2.29 CSIRO explained some of the characteristics and technological requirements of modern video-conferencing systems:

The term 'tele-presence' is used to describe high definition, high frame rate, low latency, immersive video-conferencing facilities. The experience for the user is similar to being in the same room as a person or group at the other end of the communication link. Such services typically cannot operate over ADSL links as they require high bit rate symmetric networks of the order of tens of Mbit/s ... Early tele-presence systems were expensive, costing over \$300 000 per installation. Prices have fallen rapidly in recent years and we now see commoditisation of this type of technology ...<sup>24</sup>

## Cloud computing

2.30 Cloud computing is another area where there is scope to improve efficiency in the operations of government. DOFD explained that cloud computing involves the delivery of 'technology as a service across broadband connections'. This includes the delivery of standard applications such as email and word processing, as well as data storage. DOFD suggested that 'cloud computing provides opportunities to access technology at lower cost and more flexibly than traditional computing methods'.<sup>25</sup>

2.31 National ICT Australia (NICTA) proposed that there are two avenues of benefit for governments through cloud computing:

The first is in enabling government agencies to operate their IT architectures more efficiently internally and, because cloud approaches make it easier to share data and standardised services,

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23 See, for example, Department of Regional Australia, *Submission 169*, p. 11.

24 CSIRO, *Submission 171*, pp. 5-6.

25 DOFD, *Submission 166*, p. 4.



support inter-agency integration. The second avenue lies in the ability to scale services to the public more efficiently and effectively, again using standardised services on scalable cloud architectures.<sup>26</sup>

2.32 The submission went on to comment on the necessary supporting infrastructure: 'For cloud computing to work well there must be a reliable high-speed broadband connection, such as the NBN, between the user and the cloud facility.'<sup>27</sup>

2.33 The Australian Local Government Association (ALGA) noted potential benefits from shared cloud computing platforms, and highlighted that more than 40 Victorian Councils have joined to such a platform to improve their collective ability to deliver services. The submission argued that:

The outcomes of a national broadband network are key enablers that will allow councils to transform the way services are delivered to their communities. Without such capability each council is constrained to building and maintaining its own communication and technology infrastructure that significantly diminishes the opportunity to deliver reform and innovation through collaboration.<sup>28</sup>

2.34 The Municipal Association of Victoria also focussed on the shared services initiative, and commented on the network capacity required to run these and other cloud services for local government in the future. Box 2.1 contains more information on the Association's plans.

2.35 While acknowledging the potential of the NBN for local government in areas such as cloud computing, ALGA cautioned that smaller councils in particular would need assistance to realise the potential.<sup>29</sup> The Committee considers that the Federal Government's recent announcement of the Digital Local Government Program should provide some assistance in this regard. The Program will provide grants of up to \$375 000 to councils in each of the first 40 NBN release sites '... to develop solutions that can be adopted by other councils and rolled out across the country as the NBN rolls out.'<sup>30</sup>

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26 NICTA, *Submission 198*, p. 9.

27 NICTA, *Submission 198*, p. 9.

28 ALGA, *Submission 139*, pp. 5–6.

29 ALGA, *Submission 139*, p. 5–6.

30 The Hon. Senator Stephen Conroy, Minister Broadband, Communications, and the Digital Economy, 'Local Government to Benefit from the NBN', *Media Release*, 22 June 2011.

### Box 2.1 Shared services for Victorian local governments

The Municipal Association of Victoria said that more than half of its 79 councils have collaborated in developing a shared service project and that 12 of these are now ready to implement the first stage of a shared ICT service that is planned to go live on 1 July 2011. The Association noted that:

*The outcomes of a national broadband network are key enablers that will allow councils to transform the way services are delivered to their communities. Without such capability each council is constrained to building and maintaining its own communication and technology infrastructure that significantly diminishes the opportunity to deliver reform and innovation through collaboration.*

However, to fulfil its role as an enabler of shared services (with particular benefit for rural councils), the Association emphasised that the NBN must have sufficient capacity to run council business in the 'cloud':

*The intention is to place all business applications in the cloud and manage it as a virtual service. This includes all the telephony and video-conferencing services. Whilst 100 to 1000 Mbit/s may sound excessive today we believe that as the paradigm for local government business changes we will soon see applications and services that are dependent upon these high speed networks. We believe it would be short-sighted to fix the network at the 10 Mbit/s limit of today's business need or to migrate a larger proportion of the service to a wireless solution.*

Source: Municipal Association of Victoria, *Submission 135*, p. 7.

- 2.36 Cloud computing is discussed in more detail in Chapter 6 on economic development, and is also discussed in Chapter 5 in relation to the environmental benefits of green data storage.

## Tele-working

- 2.37 Another area where government at all levels will benefit from the NBN is the increased capacity for employees to work from home or other remote locations. Tele-working, or tele-commuting, involves 'employees utilising technology to work from locations other than the traditional workplace'.<sup>31</sup> The NBN is expected to promote increased levels of tele-working by 'improving digital sharing of information and resources' and enabling 'cheaper and easier access to video-conferencing, higher speed internet and other associated IT infrastructure'.<sup>32</sup>

31 Infrastructure Australia, *Submission 10*, p. 4

32 Department of Infrastructure and Transport (DIT), *Submission 213*, p. [6].

- 2.38 A 2010 study by Access Economics (commissioned by DBCDE) found that growth in tele-working will provide a range of benefits, including:
- Time and cost savings from travel avoided;
  - Office expenses avoided;
  - Recruitment and retention gains;
  - Increased workforce participation; and
  - Infrastructure savings.<sup>33</sup>
- 2.39 The *National Digital Economy Strategy* identifies an increase in tele-working as one of the key outcomes from the NBN.<sup>34</sup> It is therefore important that the Government demonstrate leadership by promoting tele-working opportunities within its own workforce. The Committee notes that an online 'Tele-work Forum' was hosted by the Government on 3 August 2011 in order to 'showcase Australian business and government agencies that are using tele-work to improve their performance'.<sup>35</sup>
- 2.40 The 'remote' opportunities for government agencies through NBN also extend to locating more staff in regional areas. This was highlighted by the Community and Public Sector Union (CPSU):

The NBN creates the opportunity for a greater physical presence for federal government agencies outside of major capital cities. This has the potential to allow for dispersed networks of federal government 'back of office functions' such as claims processing and phone based client service work that can be used to support government shop front services in smaller population centres where the volume of client traffic may have made a physical office presence previously unviable. The location of some government services in regional centres would also provide significant economic benefit to those areas.<sup>36</sup>

- 2.41 NICTA expressed similar sentiments:

An additional benefit from pervasive broadband is that gives the government greater scope to locate government employees outside Australia's major cities. This benefits the regions [by]

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33 Access Economics, *Impacts of Teleworking under the NBN*, July 2010, p. i.

34 Australian Government, *National Digital Economy Strategy*, May 2011, p. 24.

35 DBCDE, 'Telework' <[http://www.dbcde.gov.au/digital\\_economy/programs\\_and\\_initiatives/telework](http://www.dbcde.gov.au/digital_economy/programs_and_initiatives/telework)> viewed 8 August 2011.

36 CPSU, *Submission 115*, p. 2.

bringing high-value jobs to the region, the government by lowering the cost base, and alleviates the congestion and overcrowding that plague our cities.<sup>37</sup>

- 2.42 Tele-working is discussed in several other areas of this report, including Chapter 5 which looks at the environmental benefits, Chapter 6 which looks at productivity benefits for businesses, and Chapter 8 which looks at the work-life balance issues.

### Other areas

- 2.43 The Committee was advised of less obvious areas within each unique portfolio that will also benefit from the NBN's capacity. For example, the Department of Defence's submission identified 'networked capability' and 'network centric warfare' as key components of the Defence Force's future strategy. The submission concluded:

Defence's expectation is that the NBN will provide the underlying carriage for the future Defence network, with the capacity to scale to the ADF's needs, and to reach Defence locations around Australia.<sup>38</sup>

- 2.44 Another example, identified by the Department of Innovation, Industry, Science and Research (DIISR), is Australia's Earth Observation System (EOS) capabilities. The Department advised that there are 'at least ninety-two government programs, totalling \$1.3 billion in annual expenditure, dependent on EOS'. This includes key activities such as the National Carbon Accounting System, National Weather Forecasting Services and reporting obligations under the UN Framework Convention on Climate Change. The Department concluded:

The infrastructure and communication systems needed to collect and transfer EOS data require modernisation and rationalisation to cope with the increases in data volumes that are expected over the next decade. The NBN will play an important role in providing this needed boost to capability.<sup>39</sup>

## Gov 2.0

- 2.45 'Gov 2.0' is a term that is used to describe governments' use of 'Web 2.0' technologies that rely upon user-generated content. According to
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37 NICTA, *Submission 198*, p. 8.

38 Department of Defence, *Submission 230*, p. 6.

39 DIISR, *Submission 219*, p. 6.

Government 2.0 Taskforce – commissioned in mid-2009 by then Minister for Finance and Deregulation, the Hon Lindsay Tanner – Web 2.0 ‘encompasses the way in which the internet has become a platform for the distribution of vast quantities of data’. The Taskforce also highlight that:

The tools of Web 2.0 include blogs, wikis and social networking platforms. These tools enable communities of interest to develop rapidly to find people with local knowledge or technical expertise to build understanding of issues and solve problems as they emerge.<sup>40</sup>

2.46 In its December 2009 report, the Taskforce recommended that:

Public agencies and public servants should engage more using the tools and capabilities of ‘collaborative web’ or Web 2.0. Forming or joining existing online communities of interest around issues of relevance to government policy, service delivery and regulation will help public agencies and their officers become more informed, responsive, innovative and citizen centric.<sup>41</sup>

2.47 The Government responded favourably to the majority of the report’s recommendations in May 2010, and in July 2010 released the *Declaration of Open Government*, outlining a commitment to utilising Web 2.0 technologies and making public sector information more accessible.<sup>42</sup>

2.48 Government agencies appear to have made some good progress in their adoption of Gov 2.0 technologies. Around 50 agencies have Facebook pages and around 100 have Twitter accounts, while several agencies are hosting and participating in online blogs and posting material on YouTube.<sup>43</sup> Box 2.2 contains a sample of a recent Twitter feed set up by the Australian Bureau of Statistics (ABS) for the 2011 Census.

2.49 The Committee agrees that the NBN will play an important role in furthering the Gov 2.0 agenda. The ubiquitous coverage to be delivered by the NBN will enable more people to be engaged with government online through Web 2.0 technologies. The speed of the NBN will enable government agencies to include more bandwidth intensive material in their online engagement activities.

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40 Government 2.0 Taskforce, *Engage: Getting on with Government*, December 2009, p. xi.

41 Government 2.0 Taskforce, *Engage: Getting on with Government*, December 2009, p. iii.

42 DOFD, *Submission 166*, p. 3.

43 Computerworld, *Federal Government Embracing Gov 2.0*, 9 June 2011, <[http://www.computerworld.com.au/article/389642/federal\\_government\\_embracing\\_gov\\_2\\_0/](http://www.computerworld.com.au/article/389642/federal_government_embracing_gov_2_0/)> viewed 28 June 2011.

- 2.50 Several inquiry participants commented on the benefits and potential of Gov 2.0. NICTA explained how government agencies have used social media applications to assist with emergency management:

A powerful example ... was the Queensland Police Service's use of Twitter and Facebook during the 2011 floods and Cyclone Yasi. The Queensland Police Service was able to distribute important information to a wide audience quickly and curb the propagation of rumours and false information.<sup>44</sup>

**Box 2.2** Sample Twitter feed for the 2011 Census



The screenshot shows a Twitter profile for the official account of Australia's 2011 Census of Population and Housing (@2011Census). The profile includes a blue profile picture, the account name, and a bio stating it is the official account for the 2011 Census. Below the profile information, there is a 'Following' button and a dropdown menu. The main content is a list of tweets from the account, each with a blue profile picture, the account name, and the text of the tweet. The tweets are dated from August 7th to August 8th, 2011.

Source: Twitter <<http://twitter.com/#!/2011Census/>> viewed 9 August 2011.

- 2.51 DIAC explained that the NBN and Gov 2.0 technologies will improve the capacity for public engagement on migration issues:

Considering recent changes to the migration landscape, it is expected that the community will seek to engage with the department more often by accessing departmental information

44 NICTA, *Submission 198*, p. 8.

regularly. The NBN – through wider access to social media tools and a faster internet – will support these interactions.<sup>45</sup>

2.52 The submission of the City of Geraldton-Greenough highlighted its ‘2029 and beyond’ deliberative democracy program as an example of the potential of Gov 2.0. The program seeks views from citizens about the City’s strategies and projects using online engagement tools, including a blog site that enables citizens to ‘brainstorm’ ideas for new projects. The submission noted that the NBN will assist the implementation of the program and help expand the services within the region.<sup>46</sup>

2.53 The AIIA commented on another aspect of Gov 2.0 – the increase in government information being collected and made available online. The NBN is expected to improve the capacity to transmit and leverage government data:

The Government invests heavily in collecting, analysing and transforming vast amounts of data, information and content. In a world where information is so highly valued, coupled with new technology tools that enable us to rapidly aggregate, manipulate, analyse and disseminate it, the NBN provides a means to leverage national information assets in ways that were never imagined possible. With access to high speed broadband for collecting, analysing and disseminating information, the NBN will enable the Government to use information analytics to gain better insights to business and social problems, make better decisions and create better outcomes ...

Making the data available in the public space means it can be mashed with external data sets to generate broader and whole of economy business innovation and community and national benefits.<sup>47</sup>

## Committee conclusions

2.54 The Committee agrees with inquiry participants that the NBN will be a catalyst for change both in the way government services are delivered to citizens, and in the way government agencies conduct business more generally.

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45 DIAC, *Submission 214*, p. 2.

46 City of Geraldton-Greenough, *Submission 147*, pp. 9-10.

47 AIIA, *Submission 184*, p. 6.

- 2.55 The Committee notes that there is already strong public demand for e-government services. Australia ranks highly in international comparison surveys of e-government services, suggesting that good work has been done so far in progressing the e-government agenda. But there is quite clearly a lot more that can be done. Traditional service models involving signing and posting documents or turning up at government offices are still very common. Ubiquitous and fast broadband has the potential to make citizens' interactions with government much more efficient.
- 2.56 The NBN can also facilitate efficiencies in the way government organisations undertake their day-to-day business (beyond service delivery). The Committee is confident that modern, high-quality video-conferencing systems will enable public servants and service delivery clients to travel less, providing time and cost savings as well as environmental benefits. This relates not only to interstate travel for meetings, but also to the ability of government employees to work from home. Adoption of cloud computing promises to deliver savings to governments by reducing capital spending on storage and applications.
- 2.57 Gov 2.0 applications can vastly improve the way governments provide information to, and engage with, the community. The Committee notes the work agencies have done in engaging with existing platforms (Facebook, Twitter etc.). These and other Web 2.0 technologies have a significant role to play in facilitating community engagement in government policy and decision-making processes.



## Health

3.1 Health is undoubtedly seen as the sector that will benefit most from the NBN. This was evident throughout the course of the inquiry – health was discussed in more than two thirds of submissions and at all of the hearings.

3.2 The Broadband Commission for Digital Development’s recent report argued that:

E-health is one of the most compelling applications to take advantage of high-speed broadband networks. In countries with a clear policy for an advanced broadband infrastructure, e-health allows citizens to enjoy advances in medical technology and services, at more affordable costs.<sup>1</sup>

3.3 The terms e-health and tele-health are often used interchangeably. The correct use of the terms was clarified in the submission of the Australasian Telehealth Society:

The term Tele-health refers to healthcare delivery, or closely-related processes (such as education), when some of the participants are separated by distance and information and communications technologies are used to overcome that distance ...

Tele-health is usually considered to be a subset of e-health, which refers to the use of Information and Communications Technologies (ICT) in healthcare. A primary focus of e-health is the implementation and use of Electronic Medical Records.<sup>2</sup>

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1 Broadband Commission for Digital Development, *Broadband: A Platform for Progress*, June 2011, p. 100.

2 Australasian Telehealth Society, *Submission 101*, p. 4.

- 3.4 This chapter looks at the development of e-health in Australia, particularly tele-health services, and examines the likely impact of the NBN.

## Why is e-health important?

- 3.5 As has been widely publicised over recent years, health care costs are expected to increase dramatically in the future. The situation was summarised in the Department of Broadband, Communications and the Digital Economy's (DBCDE) submission:

An ageing population, increasing rates of chronic disease and a shortage of health and care professionals is expected to put significant pressure on Australia's health care systems and budgets in coming years. The percentage of the Australian population over the age of 65 is predicted to grow from 13.5 per cent in 2010 to 22.6 per cent in 2050. Over the same period real health spending on those aged over 65 is expected to increase seven fold. Against this background there is a need to find new ways of delivering health care services efficiently and effectively, that also meet patient expectations.<sup>3</sup>

- 3.6 A similar point was made by NSW Health:

With the rise of chronic disease expected to account for almost three quarters of all deaths by the year 2020, and chronic disease already accounting for more than 80 per cent of the burden of disease and injury in Australia, establishment of a national telecommunications network which would support delivery of services via tele-health is critical to minimise the influence that chronic health has on health budgets.<sup>4</sup>

- 3.7 The widespread implementation e-health, facilitated by the NBN, will improve the efficiency of the health sector and generate significant financial savings for government, as well as savings and quality of life improvements for citizens. This point was made in the submission of the Institute for a Broadband Enabled Society (IBES):

Ubiquitous and high-speed broadband has the potential to dramatically transform the health care sector. The application of video-conferencing, sensor networks and enhanced information

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3 DBCDE, *Submission 215*, p. 9.

4 NSW Health, *Submission 117*, p. 1.

management systems can drive productivity growth in hospitals, general practice and support patients in their home.<sup>5</sup>

3.8 The Broadband Commission for Digital Development has suggested that 'cost savings through the use of e-health are expected to be between 10 per cent and 20 per cent of total healthcare costs, while maintaining a good quality of service.'<sup>6</sup> An Access Economics Study from 2010 found that the benefits to Australia from extensive implementation of tele-health may be in the order of \$2–4 billion per annum.<sup>7</sup> The Australian Information Industry Association cited a Booz & Co study that:

... estimated that rollout and adoption of core e-health capabilities in Australia is expected to be worth an estimated \$7.6 billion annually by 2020, with the primary benefits stemming from reduced errors, enhanced adherence to best practice, and enhanced workforce productivity.<sup>8</sup>

3.9 The Australasian Telehealth Society described some of the ways that savings can be realised in practice:

- Early intervention for patients in rural and remote areas can help to avoid costly hospital stays and more expensive treatment if the condition is left untreated.
- Trauma patients admitted to emergency departments of rural, remote and regional hospitals can receive appropriate intervention in the 'golden hour' following their injury, reducing further costs.
- Ageing in place delays the commencement of full-time residential care and the high personal and community costs of that care.
- Self management of chronic disease helps avoid costly interventions and residential care.
- Better targeted evacuations of patients needing care in major hospitals reduces the costs of caring for those patients, especially if they require special care during evacuations (e.g. ICU patients).
- The cost of visiting major centres for outpatients and their families can be reduced or avoided completely.

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5 IBES, *Submission 84*, p. 6.

6 Broadband Commission for Digital Development, *Broadband: A Platform for Progress*, June 2011, p. 98.

7 Access Economics, *Financial and externality impacts of high-speed broadband for tele-health*, July 2010, p. i.

8 AIIA, *Submission 184*, p. 12.

- Medical errors and the costs of dealing with their consequences can be reduced.<sup>9</sup>

3.10 The submission also described how e-health applications could help improve the utilisation of an already stretched health workforce:

While tele-health cannot create new health professionals, it can play a role in ensuring that the existing workforce is used efficiently and to its full capacity. For example, a specialist located in one hospital can deliver some services across a number of centres, helping to maintain facilities such as intensive care units in centres which might not be large enough to make use of such a specialist on a full time basis.<sup>10</sup>

3.11 Implementation of e-health initiatives is currently constrained by the inconsistent nature of broadband across the country, particularly in rural areas. CSIRO gave an example where broadband access has restricted the widespread implementation of a worthwhile e-health initiative:

The Virtual Critical Care Unit (ViCCU) ... was successfully trialled between Katoomba and Lithgow hospitals. The ViCCU system was an outstanding success, however, it was not rolled out across the state, due to the lack of a broadband communications network. A national high-speed network will reduce network connectivity costs and will stimulate the use of such tele-health technologies.<sup>11</sup>

3.12 While many of the e-health applications discussed in the remainder of this chapter do not require high-speed broadband, the Committee notes that there are many that do, and as tele-health develops in the next decade, high-bandwidth applications are likely to become commonplace. Successful e-health implementation also relies on other factors such as ubiquity and reliability of service, as explained by the AIIA:

While not all [e-health] activities necessarily require high speed broadband, the health system is exactly that – a system. An online health system requires uniform capability to enable all parts. Ubiquity is essential to ensure all Australians can benefit from all these (and more) services.<sup>12</sup>

3.13 Many hospitals and other health facilities, particularly in metropolitan areas, are already connected to high-speed fibre broadband and can take advantage of a range of e-health applications. There are, however, many

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9 Australasian Telehealth Society, *Submission 101*, p. 14.

10 Australasian Telehealth Society, *Submission 101*, p. 6.

11 CSIRO, *Submission 171*, p. 9.

12 AIIA, *Submission 184*, p. 12.

more premises, including homes and doctors' surgeries, which do not have access to the symmetric and reliable broadband connections necessary for many e-health applications.

## Tele-health applications

3.14 The inquiry received a significant amount of evidence about the various tele-health applications that exist already or that become feasible with the advent of ubiquitous, high-speed broadband. This section discusses some of those applications.

## Remote consultations, diagnostics and treatment

3.15 The NBN will enhance the capacity for people to undergo a medical consultation without travelling, as explained in the submission of DBCDE:

Pervasive high-speed broadband is a key enabler for the widespread use of high quality video consultations. In combination with work underway to provide Medicare Benefits Schedule rebates for tele-health services, this can support tele-health to become a mainstream complementary option for health service delivery in Australia.<sup>13</sup>

3.16 The Medicare changes mentioned above commenced recently – from 1 July 2011 participating medical practitioners will receive Medicare rebates for undertaking tele-consultations (further discussed below in the section on the role for government).<sup>14</sup>

3.17 The submission of the Royal Australasian College of Physicians (RACP) described how remote consultations can either be a direct patient to doctor exchange, or can involve the assistance of another health professional. The submission provided some examples where the different types of remote consultation might be appropriate:

- A patient with epilepsy who requires six monthly or annual consultations to monitor his/her response to anti-epileptic medication: in this case, the patient may consult the neurologist without an accompanying health care professional present.
- A patient recovering from a stroke at home who requires a review of her/ his progress: in this case, the patient may consult

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13 DBCDE, *Submission 215*, p. 30.

14 The Hon. Julia Gillard MP, Prime Minister, and the Hon. Nicola Roxon MP, Minister of Health and Ageing, 'Tele-health Transforming Health Care', *Media Release*, 29 June 2011.

the neurologist together with the local GP, where the GP or health care professional can carry out physical examination as directed by the neurologist (this would also be appropriate for review by rehabilitation specialists and others).

- A patient suffering an acute stroke who may benefit from thrombolysis: in this case, the emergency care physicians may consult with the neurologist on whether to administer thrombolytic therapy and to assist in monitoring the patient's condition after such therapy.<sup>15</sup>

3.18 The RACP submission also outlined the specialties that are currently involved in remote consultations or that may be appropriate for remote consultations in the future:

Consultation and cognitive specialties are more likely to adopt tele-health consultation, whereas examination based, investigative or procedural specialties require direct consultation. For example in Queensland, specialties involved include:

- Paediatrics;
- Endocrinology (Diabetes);
- Cardiology (Heart Failure);
- Geriatrics;
- Clinical Pharmacology;
- Rehabilitation;
- Nephrology (Renal Services); and
- Oncology.

Other specialties are currently involved in providing services by means of tele-health, include dermatology, palliative care and neurology. Many other scenarios are yet to be explored in Australia, although developments overseas indicate that tele-health is capable of effectively delivering a far greater range of services across a greater range of specialties.<sup>16</sup>

3.19 The inquiry heard about a number of specific examples where remote consultations are already being used or are being investigated. CSIRO told the Committee about the development of its Remote Immersive Diagnostic Examination System (RIDES), as discussed in Box 3.1.

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15 RACP, *Submission 58*, p. 4.

16 RACP, *Submission 58*, p. 4.

**Box 3.1 RIDES**

CSIRO has been active in the development of broadband tele-presence systems for healthcare for the past ten years. The Remote Immersive Diagnostic Examination System (RIDES) is one example of a broadband application it has developed for tele-health.

The RIDES system provides an immersive, high-definition specialist consultation overcoming the need for travel by a specialist or the need to preemptively transport patients long distances. Apart from high quality video and audio, the system allows high quality image exchange, data exchange and three-dimensional (3D) viewing of the patient. The system also allows the specialist to project their presence by remote use of laser pointing and marking devices.

CSIRO advised that RIDES requires a symmetric connection of 30 to 50 Mbit/s to and from the patient, which is not possible with current ADSL or HFC networks. Costs for the equipment required for this type of system are falling and it is possible that, in future, this type of technology will either run on home entertainment systems or be a module that healthcare providers can deliver to a patient's home and connect to a high speed broadband network.

Such a development also has the potential to reduce the demand on aged care services. For example, the use of remote health monitoring and 'always on' high definition video, audio and data communication available in the patient's home may delay their need to move to full-service residential aged care.

Source: CSIRO, *Submission 171*, pp. 8-9.

- 3.20 IBES told the Committee about its 'telestroke' project, which allows stroke sufferers in rural areas to be administered with a potentially life-saving drug. The drug can only be prescribed by a specialist because of its serious side effects:

The National Stroke Foundation estimates that seventy two percent of Australian hospitals are unable to provide acute stroke treatment. The Telestroke pilot study is demonstrating the feasibility and effectiveness of a remote consultation system between a comprehensive stroke centre at the Royal Melbourne Hospital and a rural hospital in Wangaratta. To date, 93 patients have been enrolled in the study. Of these patients, 20 were assessed with the telestroke system and nine of these were

administered the 'clot busting' medications with an average treatment time of 82 minutes.<sup>17</sup>

- 3.21 At its site visit to the IBES laboratory in Melbourne, the Committee was shown a demonstration of a remote dentistry project which aims to improve the quality of dental care received by residents in aged-care facilities using high-definition video technology. IBES informed the Committee that this type of technology could help dentists to better plan their workloads before visiting such facilities in person. The IBES submission explained:

Face-to-face patient examinations are regarded as the most accurate method for correct oral health diagnosis. However, only 11 per cent of aged care residents have seen a dentist in the past 12 months. Few dentists provide dental care for residents of aged care facilities ...

The project ... is investigating whether improvements in accessibility and appropriateness of oral health services can be achieved by using broadband technologies to screen for oral disease in older people living in residential aged care facilities.<sup>18</sup>

- 3.22 The Committee notes that at the site inspection the presenters at IBES indicated that the applications it demonstrated required bandwidth of no more than 20 Mbit/s.

- 3.23 The DBCDE submission outlined the operations of the Victorian Virtual Trauma and Critical Care Unit (ViTCCU), which has demonstrated the capability of high-speed broadband to improve critical and emergency care in regional communities:

ViTCCU provides support for regional doctors in smaller towns, dealing with trauma or specialist cases, by linking them (via video-conferencing supported by high-speed broadband) with trauma and critical care specialists at major Melbourne hospitals. This allows quicker decisions on the right treatment for the patient, and also helps to determine if they can stay in their local hospital or need to be sent on to a larger hospital.<sup>19</sup>

- 3.24 The CSIRO submission explained how remote eye screening could contribute to disease prevention:
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17 IBES, *Submission 84*, p. 7.

18 IBES, *Submission 84*, p. 8.

19 DBCDE, *Submission 215*, p. 31



... a national broadband communications network will support the delivery of telemedicine-based eye screening programs for sight threatening diseases such as diabetic retinopathy (DR) and Age Related Macular Degeneration (AMD).

A tele-ophthalmology service is currently being developed by CSIRO using leading edge, computer-aided ophthalmic diagnostic image analysis technologies as well as commercially available retinal scanner devices. The system will allow healthcare professionals (nurses in the first instance) to perform screenings for eye disease in Port Hedland, Western Australia, and then seek specialist consultation as needed from an ophthalmologist in Perth who decides on the course of action. In addition to providing the remote ophthalmologist in Perth with a 'real-life experience' through an immersive video-conferencing environment using 3D images and patient interactivity, the system will enable the upload of images, videos and medical history using a web-based diagnostic system (with Electronic Health Records) that can be read by other ophthalmologists.<sup>20</sup>

- 3.25 At the Committee's Sydney hearing, Dr Dean Economou, a Technology Strategist at National ICT Australia (NICTA), detailed a tele-health application for skin cancer:

A company called MoleMap has a team of dermatologists that specialise in skin cancer. It turns out skin cancer is a subspecialty. If you go to your average GP he or she may not really know about whether something is a skin cancer and they might send you to a dermatologist. The average dermatologist is barely better, at skin cancer, than that. So, there are people who specialise in this. But the efficiency of getting a person into a doctor's office, making a booking and taking the map makes it a very slow process. They have this team and you go to some sort of clinic where they take the appropriate pictures, upload those pictures and then they have their team of dermatologists basically doing one patient per minute.<sup>21</sup>

- 3.26 Dr Economou expanded on the efficiencies gained and improvements in the quality of service delivered:

The stats that came out from this MoleMap company were that they did 20 000 more patient consults with the same sized team.

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20 CSIRO, *Submission 171*, pp. 7-8.

21 *Committee Hansard*, Sydney, 29 April 2011, p. 55.

The thing that is really marvellous is that you have taken this very specialised set of patients with specialised needs and you have matched them exactly to the right people. Rather than everyone getting some sort of average service, those specialists are getting the patients that are most relevant and those patients are getting the best service. That is 20 000 extra patients covered by the same team. If you extrapolate that kind of thing to the wider medical system you can see there are some real efficiencies. They think they probably saved 250 lives because those people are so specialised they would have caught things that others would not. You hear a number like that, and that is just because the digital economy allows you to organise things and match the work to the people.<sup>22</sup>

- 3.27 The NICTA submission described an example of remote surgery from Ontario, Canada. The ability to undertake the surgery is reliant upon a 15 Mbit/s symmetric connection with very low latency:

To date, 21 telerobotic laparoscopic surgeries have taken place between North Bay and Hamilton ...

Telerobotic remote surgery is now in routine use, providing high-quality laparoscopic surgical services to patients in a rural community and providing a superior degree of collaboration between surgeons in teaching hospitals and rural hospitals. Further refinement of the robotic and telecommunication technology should ensure its wider application in the near future.<sup>23</sup>

## Electronic storage and transmission of medical data

- 3.28 The ability to store and forward medical data has become a crucial element of modern health services, and the NBN will improve the ability of health providers to undertake these activities. The Australian Medical Association (AMA)'s submission identifies the importance of timely access to information:

[Broadband] minimises slow download times, thereby both enabling medical practitioners to make time-critical treatment decisions, and preventing busy medical practitioners wasting time waiting for data to arrive electronically.<sup>24</sup>

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22 *Committee Hansard*, Sydney, 29 April 2011, p. 55.

23 NICTA, *Submission 198*, p. 12.

24 AMA, *Submission 75*, p. [1].

3.29 The AIIA made a similar point in its submission:

Healthcare decisions and service delivery depends on the ability to access the right information when and where it is needed. Access to information reduces over servicing, informs healthcare decision making, reduces the incidence of medical misadventure, enables preventative healthcare strategies and ensures citizens are empowered in the healthcare delivery process.<sup>25</sup>

3.30 The Medical Technology Association of Australia's (MTAA) submission commented on how the NBN will improve the transmission and usability of medical imagery:

High speed broadband will enhance image quality and increase the speed of data transfer. This will benefit radiology specialties where large files must be transferred and disciplines that use medical photography (e.g. for wound care). Large data intense files such as magnetic resonance image (MRI) and computer aided tomography (CAT) scans will be able to be downloaded and transferred more easily.<sup>26</sup>

3.31 There are a range of data-intensive medical activities that will be enhanced by the bandwidth capacity of the NBN, as identified by the Australasian Telehealth Society:

- Ability to rapidly transfer and interact in real time with large data sets, as generated by some 3D imaging modalities such as CT or MRI.
- High-definition interaction with camera- or computer-generated images.
- Simultaneous transmission of several video and/or data channels, which can support team interaction in complex critical care applications.
- Broadcast-quality (or better) video-conferencing to create a high sense of presence and trust, without latency-induced time delays.
- Real time guidance or even robotic control of some procedures.
- High-quality, interactive teaching, accessible by medical trainees or practitioners seeking continuing medical education, wherever they happen to be located.<sup>27</sup>

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25 AIIA, *Submission 184*, p. 11.

26 MTAA, *Submission 76*, p. 4.

27 Australasian Telehealth Society, *Submission 101*, p. 8

3.32 Mr David Ryan, Chief Information Officer of the Grampians Rural Health Alliance, told the Committee about the limitations of the current network infrastructure in his area when dealing with high volumes of data:

... you can have a video-conference and throw up an image of an X-ray, but that might then mean that your video-conference drops out or that one will be of a lesser quality than the other, if you are limited by bandwidth. So, on a 100-megabit link, you should be able to get video, data, voice and high-quality X-rays projected all at the same time. But you would not be able to do that on a four-megabit link ...<sup>28</sup>

3.33 The Committee heard that dial-up and ADSL services are inadequate to upload medical data in a timely fashion. This point was illustrated in the National Rural Health Alliance's supplementary submission:

A chest x-ray image would be about 10 MB – there are usually two per session. Thus if connections are optimal, one chest x-ray image (10 MB) would take approximately:

- 24 minutes on a 56 kbit/s dial-up connection;
- 2.6 minutes on 512 kbit/s ADSL; and
- 1 second on the 1 Gbit/s internal hospital network.

A breast screen image is a similar size, 10–15 MB, but there are usually 10 per exam so 100–150 MB in total; the time for downloading the full set would be multiplied.

... transmission of high resolution images from [a] clinic setting with [an] ADSL connection would be a slow process and the specialist would not be able to receive it during the consultation, especially if another practitioner in [the] clinic was using the internet connection at the same time.<sup>29</sup>

3.34 The ability to transmit large data files also has wider benefits in allowing Australian businesses to export medical services (more general export opportunities are discussed in Chapter 6). At the Committee's first Perth hearing, Richard Bone, President of the Western Australian Internet Association, explained how the availability of fast broadband has enabled new business opportunities in medical imaging:

In the area of health, we have a customer ... providing a medical analysis service out of Western Australia, but their service is supplied around the world. Effectively, MRI images taken from

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28 *Committee Hansard*, Ballarat, 17 March 2011, p. 32.

29 National Rural Health Alliance, *Submission 143.2*, p. 2.

locations around the world are transferred through a secure protocol to Perth. Perth basically processes them overnight and sends the results back overnight.<sup>30</sup>

## In-home monitoring

- 3.35 The availability of ubiquitous broadband enables the widespread use of in-home health monitoring applications. Many of the current devices in this area are more dependent on the availability of a reliable broadband service than high speed. However, this is likely to change over time as two-way video is incorporated into the applications.
- 3.36 The MTAA's submission provided a comprehensive list of monitoring applications that are becoming available:
- Implantable cardiac devices are able to wirelessly transmit cardiac data or information regarding the performance of a device, which can be assessed by a specialist without the need for a face-to-face routine check up.
  - Vital signs monitoring uses equipment and medical devices installed in the patient's home to identify trends and send alerts when necessary, in order to detect symptom exacerbations and intervene early.
  - Online health alerts and medication reminders can be delivered to patients online to enhance medication compliance and remind patients to take the right medication at the right time.
  - Incontinence assessment does not have to take place in a hospital or nursing home setting. A device with enuresis sensors can record incontinence events over a 72 hour period while the patient is at home.
  - Diabetic patients can have insulin levels and other vital signs monitored using automated data upload and online services.
  - There are a number of wireless devices that combine satellite global positioning systems and can be used to track dementia patients who wander.
  - Cognitive assessments can be performed in a patient's home using a personal computer and data automatically scored and sent to a specialist in a different location.
  - Patient safety can be monitored in the home using a range of alarms, alert systems and sensors.
  - Health education can be delivered online to a patient at home.
  - There are a range of Therapeutic Goods Administration (TGA) approved home monitoring systems that record and transmit

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30 *Committee Hansard, Perth, 5 May 2011, p. 29.*

daily vital signs. Peripheral devices can be used to monitor pulse, weight, blood pressure, temperature, epilepsy and subjective symptoms associated with a range of chronic diseases.<sup>31</sup>

3.37 The submission went on to detail the benefits that have been measured from a range of worldwide trials of remote monitoring applications:

- Significant improvement in glycemic control in diabetics who transmitted blood glucose and blood pressure data to a nurse.
- A 71 per cent reduction in emergency room admissions in respiratory patients who had oxygen saturation measured by pulse oximetry and monitored daily.
- A 25 per cent reduction in numbers of bed days of care and a 19 per cent reduction in hospital admissions in 17 025 veterans with chronic disease who were enrolled in a home tele-health program.
- A 43 per cent reduction in hospitalisations and a 68 per cent reduction in bed days of care in cardiac patients who transmitted daily electrocardiogram (ECG) and blood pressure data.
- A reduction in office visits and earlier detection of anomalies in patients with implantable cardiac devices who were monitored using automated, wireless technology.
- A significant decrease (45 per cent) in the need for in-patient hospital evaluation in 1339 patients with implanted cardiac defibrillators who were remotely monitored.
- Detection of a far greater number of clinical or device related events than during scheduled office visits in patients with implantable cardiac devices.
- A 50 per cent reduction in mortality in a large sample (69 556) of patients with implantable cardiac devices, including cardiac defibrillators.
- A decrease in blood pressure and a reduction in the number of medications needed to treat high blood pressure in an analysis of 37 clinical trials, including 9446 individuals using home blood pressure monitors.<sup>32</sup>

3.38 The IBES submission provided the Committee with information about the development of a device to monitor knee osteoarthritis:

The project is developing a prototype device that will be integrated with a mobile phone to enable remote monitoring of patients as they undertake typical daily activities. It is expected

31 MTAA, *Submission 76*, p. 5.

32 MTAA, *Submission 76*, p. 5.

that real time monitoring over extended periods will enable more accurate assessment of knee joint usage patterns, natural disease progression, and development of more effective interventions.<sup>33</sup>

3.39 Neuroscience Research Australia outlined how remote monitoring applications will become important in managing neurological disorders:

Successful and continued independent living in older people or those with neurological damage or disease depends on a number of key physical, cognitive and social markers of health. Monitoring these markers of health over time, and comparing them to clinical models, enables us to draw conclusions about the current physical, cognitive and social health of the individual. However, this necessitates labour intensive assessment by clinical professionals that requires the individual to travel to a central clinic or hospital facility. In remote and rural communities, especially in a country like Australia, the distance, inconvenience and expense of travel often make routine assessment of function very difficult. There is therefore a pressing need to develop data on routine or semiroutine measures that can be gathered from peoples' home environments.

Daily, weekly or monthly home-based monitoring of health also improves our ability to detect and act upon changes in these markers should they deviate significantly from an individual's history or accepted clinical models of good health. Tele-health technology, which combines digital data acquisition and broadband communication technologies to monitor health status in the home, is gaining attention as a promising strategy for acquiring accurate, reliable and time critical health marker data.<sup>34</sup>

3.40 The ACT Government's submission described its program that enables families to monitor babies in the special care nursery from home:

An example of the kind of bandwidth intensive application being developed is NICUCAM at the Centre for Newborn Care at the Canberra Hospital. NICUCAM offers remote viewing of individual babies via a secure website, so that parents who are unable to be by their newborn's bedside can view them via live video.

3.41 The submission further described how many ACT residents cannot access the service because of poor broadband coverage:

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33 IBES, *Submission 84*, p. 8.

34 Neuroscience Research Australia, *Submission 74*, p. [2].

While this service is technically available to everyone, some families are restricted to access by where they live and the broadband services they currently receive. For example, many areas of the ACT are still unable to access the internet speeds required for such applications.<sup>35</sup>

- 3.42 At the Committee's Hobart hearing, Professor Paddy Nixon outlined that technology could be utilised to remotely monitor if people have taken their medication, but also noted that there remains a human element:

Many [applications] simply spot whether you have taken the tablet out of the cupboard and not whether you have actually taken it. So there are always technological solutions to those particular things. There is still a human-technology interface that you have to work with and that is always the single most challenging part. As a technologist myself I can devise anything you want, but whether it works for you as an individual is the key question.<sup>36</sup>

## Rehabilitation and preventative health

- 3.43 The NBN will improve rehabilitation outcomes by providing patients with regular and real-time feedback. One project in this area was outlined in the IBES submission and demonstrated to the Committee on its visit to the IBES laboratory:

IBES researchers are investigating the use of *Haptic tele-rehabilitation* for stroke recovery. Haptic devices provide sensory feedback between two people in different locations, enabling them to share the sense of touch. Through the application of broadband technologies, haptic devices can provide alternative rehabilitation methods for stroke survivors. This project is developing a low-cost in-home tele-rehabilitation system to assist stroke patients in the rehabilitation process. The prototype system consists of a robotic platform on which the patient places his or her arm, and a simple rehabilitation software program that provides exercises with various degrees of difficulty. Clinicians can interact with a patient via the Internet, which allows them to monitor and change computer-based movement tasks according to the patient's performance and needs.<sup>37</sup>

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35 ACT Government, *Submission 227*, p. 6.

36 *Committee Hansard*, Hobart, 11 March 2011, p. 6.

37 IBES, *Submission 84*, p. 8.



- 3.44 Another example of remote rehabilitation was outlined by Neuroscience Research Australia and involves using conventional modern gaming systems such as the Nintendo Wii:

... by using engaging video game therapy, patients can significantly improve their movement and the range of tasks they can perform using their stroke-affected hand and arm. More importantly, patients no longer consider rehabilitation therapy a chore. This form of therapy is highly effective after only two weeks of therapy.<sup>38</sup>

- 3.45 Another way in which home-based rehabilitation can be improved is through the use of technology to give reminders to patients and maintain motivation through interactivity. This is the aim of a CSIRO program being developed to improve the rehabilitation of heart attack sufferers:

[The] Cardiac Rehabilitation Program ... is delivered by mobile phones and through a web portal. The aim of offering the program in this way is to double the number of patients completing a rehabilitation program after a heart attack. This system has the potential to save \$50 million per year in readmission costs alone in Australia. The range of possible applications, similar to the Cardiac Rehabilitation Program, is huge.

This mode of health service provision could readily be extended to treat chronic illness, diabetes and support aged care. The key to the development of such applications is that they are interactive; this will require ubiquitous broadband communications connectivity to all homes.<sup>39</sup>

- 3.46 For some ailments an important component of rehabilitation is group therapy. However, as identified by Dr George Margelis, the Australian General Manager of Intel-GE Care Innovations, in-person therapy sessions can be inconvenient and costly, and broadband-enabled technologies can offer a better solution:

The classic example is that cardiac rehab is done normally in group clinics at a hospital. We are doing a project in Melbourne at the moment with a hospital where they have a cardiac rehab program. Their biggest limitation is getting eight patients with congestive heart failure to their hospital for that one-hour session, because it requires eight taxis to pick up eight people from around Victoria, get them to the hospital, do the session and take them

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38 Neuroscience Research Australia, *Submission 74*, p. [2].

39 CSIRO, *Submission 171*, p. 10.

back home. It is important because they need to have that community effect. One-on-one does not have the same effect. If they are in the room with their peers who have similar issues they can relate to it, but there is no reason why that cannot be done virtually with the advent of video conferencing capabilities and multiuser video conferencing capabilities.<sup>40</sup>

- 3.47 Dr Steve Hambleton, then Vice-President of the AMA, told the Committee that broadband video-conferencing technology can enable doctors to remotely demonstrate to patients how to perform 'Epley maneuver' exercises, which are used to help patients with dizziness and inner ear problems. He explained that the exercises can enable patients who otherwise may need to spend seven to ten days in bed to be 'completely cured from their dizziness very quickly'. Mr Hambleton suggested that greater broadband capacity would enable these type of demonstrations to be more effective:

In my surgery, with my bandwidth, sometimes I cannot get the video to show. When I do get it, it is two inches by two inches, so it is very difficult. If you could have the whole screen and proper vision to show the patient, it would be even better ... it would be great if I could actually say, 'Here are the videos and here is the download site where you can do them and I will show you how to do them. If you are doing them at home then I could watch you.'<sup>41</sup>

- 3.48 The Committee notes that there is significant potential for broadband-enabled technologies in the area of preventative health. For example, Mr Ian Fry, Executive Officer of Ballarat ICT, told the Committee that a company in Ballarat has started online fitness courses using a fibre connection at the University of Ballarat's technology park. Mr Fry suggested that these courses could have the capacity for people who cannot make it to gyms, such as young mothers, to take part in video-based guided exercise regimes from their homes.<sup>42</sup>

## Aged Care

- 3.49 Ageing populations are an important consideration in the likely uptake of tele-health services around the world, as recently identified by the Broadband Commission for Digital Development:

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40 *Committee Hansard*, Sydney, 29 April 2011, p. 46.

41 *Committee Hansard*, Canberra, 4 March 2011, p. 16.

42 *Committee Hansard*, Ballarat, 17 March 2011, p. 25.

Aged care services are at the forefront of developments for in-home technologies using broadband. It is estimated that there are currently around 550 million senior citizens worldwide. The elderly outnumber children in countries such as Japan, Bulgaria, Germany, Greece, Italy, and Spain.<sup>43</sup>

- 3.50 In this context, the capacity of the NBN to be a conduit for home-based aged care services is of fundamental importance:

A key component of solutions will be homecare services. Video-based broadband connections allow people to stay at home and still have access to medical staff at monitoring hubs that provide services ranging from automated analysis of data from personal health systems, to advice from qualified nurses on call throughout the day.

These layered response systems can alleviate demand for expensive clinical staff and significantly ease the anxiety levels experienced by family carers. The nurses maintain contact with people who need medical assistance and other medical specialists can be brought in as required via video link.<sup>44</sup>

- 3.51 While one important advantage of widespread home-based service is the financial savings and efficiencies, an equally important advantage is the improvements to quality of life. This was identified by Dr George Margelis of Intel-GE Care Innovations:

If we can deliver services that enable people to delay or if possible totally remove the need for them to spend their last years in a nursing home, we can improve that person's quality of life and also improve the quality of life of their family. The major issue we face in nursing homes [is] that family and friends cannot come and visit when the nursing home is 20 kilometres away from work and they need to go and spend the day. So, how we use these technologies in the home is critical.<sup>45</sup>

- 3.52 The Australasian Telehealth Society's submission recognised that technology has been important in aged care for many years, and this will increase as broadband coverage and speeds improve. The submission went on to describe the features of modern technologies in this field:

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43 Broadband Commission for Digital Development, *Broadband: A Platform for Progress*, June 2011, p. 101.

44 Broadband Commission for Digital Development, *Broadband: A Platform for Progress*, June 2011, p. 101.

45 *Committee Hansard*, Sydney, 29 April 2011, p. 44.

Recent systems can provide various forms of interaction for the subjects (such as high quality video-conferencing with a carer), as well as automated systems for monitoring vital signs and other measures of well-being.<sup>46</sup>

- 3.53 A recent trial of aged care technology in the Hunter region has demonstrated the practical benefits that can be delivered. This project was detailed to the Committee by Dr Margelis of Intel-GE Care Innovations:

... we delivered technology into the homes of about 50 patients who were at that stage receiving regular care by a home nursing service. Hunter Nursing is a nursing service and it has about 400 nurses. They basically go and visit people in their home and deliver healthcare services. What we did is pick 50 of those patients who had the highest needs. These were patients whose average age was about 83. We delivered a little white box into their home, which for all intents and purposes was a small computer but was designed to be used by someone who did not know anything about computers. So, the classic patient had never used a computer before in their life and had never had to worry about those sorts of things. This device spoke to them, gave them very large onscreen prompts, took them through a process of healthcare delivery and enabled them to also communicate with their healthcare provider remotely. So, the nurse sitting at her desk at Hunter Nursing could video-conference to this patient and discuss their health concerns. They could get information about their blood pressure, weight, blood oxygen, general wellbeing and actually ask the patients questions about how they felt, and it did all that quite simply. Ninety-nine per cent of the patients were satisfied with the way it was used. It was very easy to use. We had no issues around the technology.<sup>47</sup>

- 3.54 Dr Margelis identified that the biggest challenge for the project was getting a reliable broadband connection:

I had the resources of the world's largest microprocessor company running around trying to get those network connections, and the engineers spent more of their time finding a network connection ... We really came to the understanding that, if we had access to ubiquitous connectivity in these people's homes, our job would have been a lot easier. I would not have had my guys running around the

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46 Australasian Telehealth Society, *Submission 101*, p. 5.

47 *Committee Hansard*, Sydney, 29 April 2011, pp. 44–45.

streets literally with antennas trying to find the best spot to find a 3G connection and run a cable out of people's homes.<sup>48</sup>

3.55 As mentioned above in relation to in-home monitoring, many current applications are more dependent on reliable broadband than fast broadband. But as identified in the Hunter trial, the ability to have two way video interactions is vital for the most effective delivery of home-based aged care services. Dr Dean Economou of NICTA told the Committee about an example in Korea where high-definition video conferencing capability is used to supplement sensor alerts. The video quality allows experts to make informed decisions about the type of care required in emergency situations.<sup>49</sup>

3.56 The DBCDE submission highlighted that the NBN will also enable improved support for carers:

Comprehensive, rich online training content and environments and ongoing real-time interactive support for carers of people with dementia could assist not only in providing best practice care for those with dementia living in the community, but also in reducing uncertainty and pressure on the more than 100 000 carers.<sup>50</sup>

## Mental health

3.57 The Committee heard evidence about the benefits of the NBN in the delivery of mental health services. The Department of Health and Ageing claimed that the reach of these services will be improved. The department further noted:

Low bandwidth internet connections can be a deterrent to seeking treatment, particularly when consumers are already suffering a degree of stress or anxiety. A slow response by web based systems can create significant barriers to seeking help online, which is designed to provide consumers with choice and an anonymous avenue for seeking help.<sup>51</sup>

3.58 The inquiry heard on a number of occasions that while mental health issues are becoming more prevalent in society, young people, in particular, are reluctant to see mental health services in person. This point

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48 *Committee Hansard*, Sydney, 29 April 2011, pp. 45.

49 *Committee Hansard*, Sydney, 29 April 2011, p. 60.

50 DBCDE, *Submission 215*, p. 35

51 Department of Health and Ageing, *Submission 212*, p. 6.

was made in the submission of the Inspire Foundation, who also commented on the damage caused by mental illness:

The research shows that whilst one in four young people aged 16 to 24 experiences a mental disorder, 70 per cent of those same young people are unable or unwilling to receive clinical care – a problem that is compounded in the case of young men and those living in rural and remote areas of Australia. Left untreated, mental health problems worsen, impacting significantly on the quality of a young person’s life including their relationships with family and friends, and their eventual educational and vocational achievement. In 2009 mental illness cost Australia \$10.6 billion in lost productivity, underemployment, absenteeism, welfare payments, health care expenditure and carer costs.<sup>52</sup>

3.59 The submission of the National Rural Health Alliance further outlined the case for online service delivery and the plight of those in regional areas:

Mental health services are increasingly being provided via the internet and have been found to be effective, particularly for young people. In Australia, suicide rates have consistently been found to be higher in rural than in metropolitan areas. Adolescent and young adult males, especially those in rural or remote areas, have particularly high suicide rates. The availability of the NBN will enable people living in rural and remote areas to have the same access to online mental health support as people in metropolitan areas.<sup>53</sup>

3.60 The Committee heard valuable evidence from Helen Pepper, a Youth Ambassador for the Inspire Foundation, and a recent beneficiary of online mental health service delivery. Ms Pepper provided her perspective on the NBN and its capacity to improve mental health services:

To be honest, when I first heard about the government’s plan for the National Broadband Network, I did not entirely support it. I wondered how it could be of higher priority than investing in Australia's health system. I thought, ‘How can it be more important for young people to be able to view web pages and complete downloads faster when mental health disorders and suicide account for approximately 14 per cent of Australians’ total health burden’. I got so caught up in the stereotypical view of

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52 Inspire Foundation, *Submission 194*, p. 3.

53 National Rural Health Alliance, *Submission 143.1*, p. 5.

young people and the internet that I looked over my experience of how they can work so fantastically together.

ReachOut already connects young people from all over the country through their forums, but text based discussions can only go so far and offer so much. So online interactive media would complement ReachOut's youth involvement strategy amazingly by bringing young people together without the financial and time costs associated with face-to-face interactions.<sup>54</sup>

- 3.61 Emma Stace, Deputy CEO of the Inspire Foundation, described how online services might evolve over time:

My philosophy is that the internet is a displacer, not a replacer, meaning that it will complement and enhance what people are doing already but it does not stop what people are doing already. I certainly see – not now but in the future – that the ability to deliver a highly interactive multimedia-rich interaction could potentially, one day, begin to replace face-to-face engagement with a health provider. But that is probably quite a long way off.<sup>55</sup>

- 3.62 Aram Hosie, also of the Inspire Foundation, explained how current broadband coverage has restricted the organisation's ability to deliver mental health training to teachers:

The consistent feedback we get from teachers is that the reliability of the video streaming and the quality of the interaction are really poor. In all the evaluations we do of our program they say that the content was great and the ability to access a webinar was great but the frustration was that the link kept dropping, the video kept dropping and the quality was poor – and there is nothing we can do about that at the moment. As speeds and bandwidth go up, that will get better.<sup>56</sup>

## Improved service in regional areas

- 3.63 The tele-health applications outlined above clearly provide the most benefit in the areas where there are difficulties in accessing quality health services. The inquiry received substantial evidence about the capacity of the NBN to improve health services in regional areas. Dr Jenny May of the
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54 *Committee Hansard*, Canberra, 27 May 2011, pp. 10–11.

55 *Committee Hansard*, Canberra, 27 May 2011, pp. 14–15.

56 *Committee Hansard*, Canberra, 27 May 2011, pp. 11–12.

National Rural Health Alliance summarised this proposition at the Committee's first hearing in Canberra:

The alliance believes the NBN provides a real opportunity to improve the health outcomes of those in rural Australia, as well as the wellness and liveability of rural communities. It has the capacity to improve the lot of those who live in rural, regional and remote areas by enhancing access to health information, education for our children and jobs for our spouses. Not only do Australians who live outside metropolitan centres have higher risk factors for many ailments, they also, as we know, have poorer access to health care and health personnel. With the support of a high-speed broadband system, improvement in health outcomes can be achieved through the development of healthy communities.<sup>57</sup>

3.64 The submission of the Telehealth Society also observed that while equal access to healthcare is considered a fundamental right by most people, 'Australia's large distances and widely distributed demographics create challenges in providing this equity of access'. The Society cited a recent Australian Institute of Health and Welfare study which found that 'life expectancy for non-indigenous males living outside major cities was three years less than the life expectancy for their metropolitan counterparts'.<sup>58</sup>

3.65 Dr May of the National Rural Health Alliance explained that the availability of broadband is currently the missing link in the provision of e-health services to regional areas:

Many valuable applications for tele-health and e-health more broadly are already technically feasible but available only where there is high-speed connectivity. Real-time video-conferencing for specialist consultation, the transfer of digital images such as X-rays and CAT scans and the transfer of other information is already here and making a difference where it can occur. Highspeed broadband will provide the platform for making these proven modalities – as well as those yet to be developed – available everywhere. In emergency care, for example in a place like Marble Bar, it will enable the linking of a remote outpost to a major burns unit so that a remote specialist can visualise a burn, assess the condition of a patient and advise local staff.<sup>59</sup>

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57 *Committee Hansard*, Canberra, 29 March 2011, p. 2.

58 *Australasian Telehealth Society, Submission 101*, p. 5.

59 *Committee Hansard*, Canberra, 29 March 2011, p. 3.



- 3.66 The Grampians Rural Health Alliance is one regional healthcare provider that is already demonstrating the types of benefits that can be delivered in regional areas with broadband. See Box 3.2 for details. Mr David Ryan, CIO of the Alliance, outlined that his service is spread across multiple campuses and the use of video-conferencing has been significant, both for meetings and for seeing patients. Mr Ryan also commented that:

It is a significant reduction on travel and in fact it has almost eliminated travel for some people, which is therefore an accrual of savings back to the health service directly. That also means that the clinician has a much more productive day. There are also the safety issues with jumping in a car and travelling long distances on country roads. That is also a major problem.<sup>60</sup>

- 3.67 The McKinlay Shire Council outlined how the NBN might impact those people living in the most remote areas:

The Julia Creek Hospital is staffed by a full time GP position. Members of the community are required to travel 250km to Mount Isa or 650km to Townsville to receive medical services from specialists. The NBN could enhance medical services through the virtual appointment of specialist services at the Julia Creek.<sup>61</sup>

- 3.68 Regional Development Australia (RDA) Townsville and Northwest Queensland also highlighted that the NBN will enable easier access to specialists:

Regional Australians are at a disadvantage when it comes to access to health services. High speed broadband will enable greater and more efficient interaction between specialists in regional and metropolitan centres and their patients and local GP.<sup>62</sup>

- 3.69 It is likely that the NBN can contribute to improving health outcomes in very remote Indigenous communities. The Telehealth Society's submission presented the example of Numbulwar, located on the north-east coast of the Northern Territory, with a population of 672 people – just over half the population is under 25 and 95 per cent are Indigenous. The community does not have a resident medical practitioner. Darwin is accessible only by poor quality roads that are impassable in the wet season. The Society further described:

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60 *Committee Hansard*, Ballarat, 17 March 2011, p. 30.

61 McKinlay Shire Council, *Submission 31*, pp. 1-2

62 RDA Townsville and Northwest Queensland, *Submission 202*, p. 2.

Presently, tele-health services are delivered via the only internet connection available, a 512 kbit/s Telstra link shared by all services. The satellite link planned as part of the NBN may make a substantial difference to healthcare available in this isolated community.<sup>63</sup>

### Box 3.2 Grampians Rural Health Alliance

The Grampians Rural Health Alliance is a not-for-profit joint venture established to represent all the public health services in the Grampians region of Victoria, including community health, acute health, sub-acute health and aged care. There are approximately 40 sites with about 160 network connections across the region, for which the Alliance provides the ICT support and telecommunications services.

Video-conferencing is now being used in many different ways throughout the region covered by the Alliance, including for professional development and training, for specialist to GP issues, and increasingly for clinical engagement.

The mobile high-definition video-conferencing units used by the health service in rural areas are currently working on 2 Mbit/s symmetrical links, shared between voice and data. However, whereas it is possible to have one video-conference using this infrastructure, the bandwidth is not sufficient for two or more high quality conferences at once.

The Alliance said that the bandwidth capacity provided by the NBN will bring equity of health services across the region, particularly for specialist services in more remote rural areas for which video-conferencing is increasingly relied upon.

Source: Mr David Ryan, Executive Officer and Chief Information Officer, Grampians Rural Health Alliance, *Committee Hansard*, Ballarat, 17 March 2011, p. 34.

## Health professional in regional areas

3.70 The submission of the National Rural Health Alliance highlighted the ongoing difficulties in attracting medical practitioners to rural areas, and explained how the NBN might improve this situation:

There is a continuing struggle to secure more health professionals for rural and remote areas: doctors, nurses, allied health

63 Australasian Telehealth Society, *Submission 101*, pp. 6.

professionals, dentists and other oral health workers, paramedics as well as aged care workers. Major change is needed to the models of education and training for students of health professions. Every effort should be made to provide this training close to where students live and the NBN is critical to this.

In addition, rural and remote placements and other programs to consolidate and expand the rural health workforce rely on the support of the NBN to keep students and new health professionals in touch with their peers, able to access professional advice and continuing professional development, and to work with current technology. And good telecommunications are not just vital for professional work and support; they also enable people to maintain their social networks and links with their families.<sup>64</sup>

- 3.71 The issue of networking and mentoring is a particular issue for regionally located health professionals. The Telehealth Society described how improved access to professional support may reduce costly mistakes:

Despite the high quality of health care in Australia, ‘adverse events’ in the hospital system have been estimated to cost the nation between \$1 billion and \$2 billion annually, with a large proportion of such events seen to be preventable. In a number of recent, well-publicised cases, medical practitioners in regional areas were found to have been practising beyond their level of training, and without adequate supervision or contact with their peers. There is likely to be a role for tele-health in creating such contacts, and providing facilities for mentoring and monitoring the performance of isolated practitioners.<sup>65</sup>

- 3.72 The inquiry heard there is demand from students who want undertake their medical education in regional areas. Ms Meredith Feist, Manager of Operations and Community Engagement at Flinders University Rural Clinical School, explained that:

[The courses] are oversubscribed. People actually want to do the course – they want to come to the country – and part of the reason for that is that often the academic marks are better. They come away from their third year with a high level of clinical exposure and skills because they have had the continuity of patient care and they have had lots of things that they do not get elsewhere. I guess our drive is to get them out here, convert them, tell them that the

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64 National Rural Health Alliance, *Submission 143.1*, p. 9.

65 Australasian Telehealth Society, *Submission 101*, pp. 5–6.

country is a wonderful place and immerse them in that community for one year so that we increase that chance.<sup>66</sup>

- 3.73 Ms Feist also told the Committee that improved access to broadband would help attract and keep doctors and nurses in regional areas:

The benefits [of the NBN] to this community, as I see them, will be in helping to get health professionals to stay in the area or return to the area. Our current research indicates that about 65 or 67 per cent of students who go through a [Parallel Rural Community Curriculum]-type program do return at some point to rural and remote areas, and we just want to keep growing that.<sup>67</sup>

## E-health records

- 3.74 An important component of e-health is the development of e-health records. The Committee heard that the NBN will be a catalyst for the continued development e-health records. This point was highlighted in the Broadband Commission for Digital Development's recent report: 'A national broadband network offers the unique opportunity for transformation of isolated and inefficient systems'.<sup>68</sup>

- 3.75 The Department of Health and Ageing's submission explained the problems and inefficiencies with current systems used to manage health information:

Patients currently have limited access to and control over their own health information. Their health information is largely fragmented and held in paper based record systems across each health care provider they have seen. Each health care provider usually only has an incomplete record of a patient's medical history and care needs. This means a patient's critical health information may not be available when and where they are being treated, especially in emergencies or when seeing multiple doctors ...

As well as being frustrating for patients and their health care providers, deficiencies in the availability of a patient's health information can have damaging effects on patients' health and the

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66 *Committee Hansard*, Victor Harbor, 5 April 2011, p. 23.

67 *Committee Hansard*, Victor Harbor, 5 April 2011, p. 19.

68 Broadband Commission for Digital Development, *Broadband: A Platform for Progress*, June 2011, p. 100.

quality of care they receive. Many adverse drug events and poor transitions from one health care setting to another could be avoided with better access to patients' health information across care settings.<sup>69</sup>

3.76 The IBES submission explained how the NBN will improve information flows in the health system:

The health sector is an information rich environment, in which the medical profession has traditionally controlled both access to and the form of information. Health data is currently stored in multiple places, often 'siloes', and has the challenge of privacy, data accessibility, comparability and initial collection. The advent of ubiquitous and high-speed broadband will allow sharing of patient information rapidly between sites, and allowing clinicians to access real time data during a patient consultation.<sup>70</sup>

3.77 The Government is currently working toward the provision of a 'Personally Controlled Electronic Health Record' for all Australians, as part of a \$466.7 million commitment in the 2010-11 Budget.<sup>71</sup> The DBCDE submission outlined how the NBN is likely to assist this process over time:

By providing a high capacity, ubiquitous and reliable network, the NBN will enable the benefits of system-wide electronic health records to be fully realised ... Doctors and specialist medical practitioners in various health settings and locations across Australia will be able to have fast and reliable access to patient health records, including data intensive, high resolution medical images and videos.<sup>72</sup>

3.78 The DBCDE submission also outlined the benefits of e-health records for Australians with chronic conditions (for example, diabetes, chronic obstructive pulmonary disease, cystic fibrosis). Such individuals are often high users of health services, requiring ongoing and integrated care. Benefits would also be felt by older Australians who may have complex medical needs, and may at times have difficulties in remembering details of their health history. The DBCDE submission further suggested that:

Ensuring all relevant information is able to be provided to key health personnel can support swifter and more effective diagnosis

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69 Department of Health and Ageing, *Submission 212*, p. 1.

70 IBES, *Submission 84*, p. 7.

71 Department of Health and Ageing, *Personally Controlled Health Records for All Australians*, Media Release, 11 May 2010.

72 DBCDE, *Submission 215*, p. 36.

and treatment, informed by knowledge of existing medications and past health events.<sup>73</sup>

## Medical education

3.79 As outlined in the following chapter, the NBN is expected to have a significant impact on the provision of education services and the availability of educational resources. The inquiry received specific evidence about how the NBN will impact medical education. The DBCDE submission provided an overview of the range of opportunities which may enhance support services for GPs and other health professionals, resulting in improvements to skills and capabilities ‘without having to waste time in traffic or long distance travel’. The opportunities may include ‘content rich online real-time interactive continuing professional development courses (including, for example, 3D virtual environments), or mentoring by senior practitioners facilitated through video-conference.’<sup>74</sup>

3.80 Professor Don Iverson, Pro Vice-Chancellor of Health at the University of Wollongong, told the Committee about the expectations of his medical students:

Each successive group that has come in has greater expectations on technology. They have grown up with technology and most of us in this room did not ... These young people who are coming through medical school now are absolutely comfortable with and rely on technology for virtually every aspect of their life ... When they go out to rural areas, they expect to be able to get their cases online and to be able to go online to check a physician reference with regard to medication. They are finding it frustrating right now doing that.

3.81 Professor Iverson also spoke about the significant role that the NBN can play in developing ‘communities of doctors and nurses that support one another’. He noted the importance of social connectivity, not just professional connectivity, for medical students who move to regional areas.<sup>75</sup>

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73 DBCDE, *Submission 215*, p. 37.

74 DBCDE, *Submission 215*, p. 32.

75 *Committee Hansard*, Wollongong, 28 April 2011, pp. 3–4.

- 3.82 Professor Iverson went on to explain the increasing importance of broadband in modern teaching methods:

The key to making the model [of locating students remotely] work is connectivity; it just cannot work without it. We cannot travel those distances; we cannot do it. The connectivity is important for a number of functions. The first one right now is teaching. For example, a third of our class of medical students are actually housed down in Nowra, and they only come to Wollongong one day a week. All the lectures and that are delivered via video link, which sometimes works and sometimes, unfortunately, does not work if the weather turns bad. We actually now have another hub we are developing up in the Southern Highlands area, and ultimately, if you look down the road 10 years, there is no reason why a lot of medical education cannot occur in the home town where people are connected to it. There is just no reason; we are moving that fast. But connectivity becomes important.<sup>76</sup>

- 3.83 As well as delivering lectures and tutorials, broadband has been used to provide surgical training. This was outlined in the submission of the Telehealth Society:

The ability of advanced networks to deliver several channels of high quality video in interactive settings has been used by the surgical community to provide training in advanced surgical techniques. Notable among the international demonstrations have been connections between Flinders Medical Centre and various Asian centres. Most of these exercises have been set up as 'one-off' events, but the availability of the NBN will facilitate making such interactive education available on a routine basis to medical practitioners wherever they are located. High quality video and interactivity (e.g. the ability to ask questions of the surgeon) are essential for the success of the learning experience.<sup>77</sup>

- 3.84 Meredith Feist of the Flinders University Rural Clinical School explained that current broadband infrastructure in some areas is struggling to cope with new modes of delivery:

What we have here at the moment is a system – and I am not technical – that delivers two megabits per second for video-conference capacity. We manage, just, with that, here in Victor. In two of our other sites we have that capacity at 10, and that is now

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76 *Committee Hansard*, Wollongong, 28 April 2011, p. 3.

77 *Australasian Telehealth Society, Submission 101*, pp. 10-11.

at maximum and stretched for the work we need to do. So we think it is vital to keep going.<sup>78</sup>

## Government leadership

- 3.85 Based on extensive evidence, the Committee accepts that the NBN will play a significant role in substantially improving the implementation of e-health systems, but that challenges remain in effecting wider change. The Telehealth Society noted that ‘the slow uptake of e-health technologies over the last few decades has shown that such paradigm shifts are very difficult to implement in the health system’. The Society further suggested that a national strategy is needed to facilitate and encourage ‘the changes to health care delivery which will justify the NBN on the basis of its ability to deliver healthcare services’.<sup>79</sup>
- 3.86 While estimates of the savings to be gained from using coherent e-health systems range from 15 to 25 per cent<sup>80</sup>, the health system involves a substantial number of unique providers of services, each with their own business models and proprietary administrative systems. This makes system-wide change very difficult. Furthermore, the Broadband Commission for Digital Development has noted that:
- A key reason for the delays in implementing e-health is that its benefits cover society as a whole and do not necessarily have immediate positive consequences for the commercial aspects of healthcare.<sup>81</sup>
- 3.87 The Committee agrees with the observation of the Broadband Commission that ‘leadership is needed to develop a trans-sectoral approach to these problems, so that the multiplier effects that broadband infrastructure has to offer are fully explored’.<sup>82</sup>
- 3.88 The Government’s recently announced *National Digital Economy Strategy* identifies the need for government leadership and sets a number of digital economy goals for e-health:
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78 *Committee Hansard*, Victor Harbor, 5 April 2011, p. 19.

79 *Australasian Telehealth Society, Submission 101*, p. 12.

80 *Broadband Commission for Digital Development, Broadband: A Platform for Progress*, June 2011, p. 106.

81 *Broadband Commission for Digital Development, Broadband: A Platform for Progress*, June 2011, p. 106.

82 *Broadband Commission for Digital Development, Broadband: A Platform for Progress*, June 2011, p. 106.



- By 2020, 90 per cent of high priority consumers such as older Australians, mothers and babies and those with a chronic disease, or their carers, can access individual electronic health records.
- By July 2015, 495 000 tele-health consultations will have been delivered providing remote access to specialists for patients in rural, remote and outer metropolitan areas.
- By 2020, 25 per cent of specialists will be participating in delivering tele-health consultations.<sup>83</sup>

3.89 As discussed earlier in this chapter, the Government is now providing funding for Medicare rebates of tele-health consultations (including incentives for GPs and specialists), and is also progressing the development of e-health records. In addition, the Government is funding tele-health trials in the NBN early release sites of Kiama, Armidale and Townsville.<sup>84</sup>

**Box 3.3 Neuroscience Research Australia falls prevention software**

The rollout of the NBN has enabled the trialling of an innovative new tele-health program that enables patients to access at home an interactive, video game-based exercise program designed to improve their balance and motor skills.

The project involves an exercise regime for older people using a dance mat video game, which can be monitored remotely by health professionals using high speed internet. It is envisioned that the technology will reduce the incidence of falls amongst its older users.

The project was developed by Dr Stuart Smith of Neuroscience Research Australia, who said:

*With a growing number of people having to care for family members living with diseases that affect their mobility or their mind, a reliable high speed broadband network such as the NBN for monitoring and improving their state of health is a huge breakthrough.*

The project was showcased at an NBN launch event in the coastal NSW town of Kiama on 29 July 2011.

Source: Neuroscience Research Australia, 'NeuRA falls prevention research showcased at NBN launch', 1 August 2011 <<http://www.neura.edu.au/news-events/news/neura-falls-prevention-research-showcased-nbn-launch>> viewed 8 August 2011.

83 Australian Government, *National Digital Economy Strategy*, May 2011, p. 14.

84 Australian Government, *National Digital Economy Strategy*, May 2011, pp. 34–35.

- 3.90 Notwithstanding these initiatives, several submissions and witnesses commented on issues that will need to be addressed by governments to achieve widespread e-health implementation, beyond the technical and infrastructure requirements for reliable and ubiquitous broadband. At the Committee's Sydney hearing, Ms Rosemary Sinclair, Managing Director of the Australian Telecommunications Users Group, described some of the practical considerations, resulting from a pragmatic understanding of how the Medicare system works:

As a general rule there is no mechanism in Medicare for paying for e-delivered health services apart from psychiatric services in regional Australia and the election commitment last year which created another small element for regional services. But GPs get funded through Medicare when people turn up to the surgeries for attendance.<sup>85</sup>

- 3.91 The Telehealth Society's submission also commented on the importance of Medicare arrangements:

All medical practitioner members who contributed to [our] submission emphasised that the ability to deliver health care services via tele-health needs to be recognised through the ability to be remunerated through the Medicare Benefits Schedule (MBS) for a wider range of services than currently available.<sup>86</sup>

- 3.92 The RACP submission identified that in general specialists have not adopted technology, which could act as a significant barrier to widespread adoption of tele-health applications:

Unlike the situation in general practice, computer use is not a central part of the way in which physicians conduct their practices in their consulting rooms, the most usual venue in which they deal with patients.

Against this background, the Australian Government's specific proposal to provide incentives is welcomed by the RACP, as this will assist greatly in helping physicians engage with tele-health. The development and implementation of a specialist practice incentives program is encouraged.<sup>87</sup>

- 3.93 The RACP also identified privacy issues that are relevant to both tele-health and the implementation of e-health records:
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85 *Committee Hansard, Sydney, 29 April 2011, p. 42*

86 *Australasian Telehealth Society, Submission 101, p. 14.*

87 *RACP, Submission 58, p. 5.*

Patients may initially be reluctant to engage in video-conferencing because of uncertainty that their privacy and the confidentiality of their information will be adequately protected. The patients, and the Australian public generally, will need reassurance of the security and integrity of information obtained and transmitted during tele-health consultations.<sup>88</sup>

## Committee conclusions

- 3.94 The availability of fast and ubiquitous broadband will fundamentally change the delivery of health services in Australia. It will enable more efficient service delivery, resulting in cost and time savings for citizens and health care providers. It will also enable better access to services for those who are isolated by distance or incapacity, resulting in improved health outcomes and enhanced quality of life.
- 3.95 The ability to deliver services more efficiently is extremely important in the context of the ageing population and the related increases in healthcare spending. There have been a number of estimates made about the savings that might be possible, including a recent UNESCO report which estimated savings of between 10 and 20 per cent of total healthcare spending. Savings can be realised in a range of ways, from reduced hospital admissions through to more productive use of the stretched medical workforce.
- 3.96 The Committee received evidence about numerous tele-health applications – some which are available now, some which are being developed, and others which are still in a conceptual stage. It is difficult to generalise about the broadband speeds required to enable these applications, although it is possible to conclude that the reliability of service and ubiquitous coverage are paramount. In terms of speed, there are home-monitoring applications that rely on the ability to upload at just 512 kbit/s. The Committee heard that even these speeds are not achievable in many areas today. But, more importantly, there are very few homes that can receive the broadband speeds required for the high-definition video interactions required by some tele-health applications.
- 3.97 Participation in remote consultations with specialists may be commonplace in the foreseeable future. CSIRO told the Committee about its remote diagnostic system which involves 3D imaging and requires a

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88 RACP, *Submission 58*, p. 7.

symmetric connection of between 30 and 50 Mbit/s. Other similarly bandwidth-intensive applications were outlined and demonstrated to the Committee, including tele-dentistry and tele-ophthalmology. It is expected that tele-health applications will be used in hospitals, clinics, aged-care facilities, and in the home – hence the need for ubiquitous high-speed coverage.

- 3.98 The ability to store and forward high volumes of medical data is an important factor in improving the efficiency of the health system, and will become particularly important when there is a move toward full-scale implementation of electronic health records. High quality medical imagery generates large amounts of data and high-definition video generates even more. A more efficient health system will rely upon the ability to transmit this data seamlessly, including from the home. The asymmetric broadband connections available to most Australian premises are not suited to uploading data quickly.
- 3.99 As well as enabling video consultations from the home, the NBN will expand the opportunities for health monitoring in the home. Current activities in this area including monitoring blood glucose and pressure, as well as tracking the performance of implanted devices such as pacemakers. The Committee heard that home monitoring devices can be supported by video-conferencing capability, which further reduces the need for medical staff to be physically present.
- 3.100 The Committee received compelling evidence about the importance of online delivery of mental health services, particularly for young people. It is clear that ubiquitous availability of fast broadband will enable improved content-rich and interactive mental health services.
- 3.101 Australians who have the greatest difficulty accessing services in person are likely to benefit most from advances in e-health. This includes the elderly, those with a physical disability, and those located in regional communities. For the elderly, the provision of broadband-enabled consultations and in-home monitoring will delay or even remove the need to move to an aged-care facility. For regional Australians, the NBN provide greater access to metropolitan standard health services, without having to travel to metropolitan areas. Improved access to broadband is also likely help attract and retain medical professionals in regional areas, providing better networking and ongoing development and training opportunities.
- 3.102 The Federal Government has identified the importance of e-health in its recent digital economy strategy, setting goals for e-health uptake and providing funding for tele-health trials in three NBN early release sites. In

addition, Medicare rebates have recently commenced for tele-health consultations, and work continues toward the development of electronic health records.

- 3.103 The Committee was made aware of the difficulties of effecting change in a health system that involves so many unique organisations and systems. Key challenges to e-health implementation include privacy and the low uptake of technology by specialists. These are not new issues and are undoubtedly central to considerations on the e-health agenda. Government leadership on these and other issues will determine the extent to which the benefits offered by the NBN are realised.



## Education

- 4.1 The Australian Information and Communications Technology in Education Committee (AICTEC), an advisory body consisting of representatives from Australia's education sector at all levels and across all states and territories, submitted that:

In Australia and internationally, reliable and affordable broadband connectivity is recognised as having the capacity to transform the ways in which teachers, students and their families communicate, collaborate and access educational resources across traditional boundaries.<sup>1</sup>

- 4.2 The Federal Government has identified expanded online education as one of its key goals in the *National Digital Economy Strategy*:

By 2020, Australian schools, TAFEs, universities and higher education institutions will have the connectivity to develop and collaborate on innovative and flexible educational services and resources to extend online learning resources to the home and workplace; and the facilities to offer students and learners, who cannot access courses via traditional means, the opportunity for online virtual learning.<sup>2</sup>

- 4.3 The Department of Broadband, Communications and the Digital Economy (DBCDE) told the Committee that ubiquitous, high-speed broadband has the capacity to 'significantly extend the reach, availability and quality of educational services, particularly in regional areas' and enable 'more intensive and immersive online interactions, resulting in higher quality outcomes for students'.<sup>3</sup>

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1 AICTEC, *Submission 124*, p. 4.

2 DBCDE, *National Digital Economy Strategy*, May 2011, p. 36.

3 DBCDE, *Submission 215*, p. 39.

- 4.4 The Department informed the Committee of several overseas studies which show that online learning can actually result in higher rates of learning, rates of course completion and performance in standardised tests for students.<sup>4</sup> Similarly, Mr Paul Lange, member of the Australian Council of Private Education and Training (ACPET), told the Committee about a study which demonstrated that online delivery of education resulted in significantly better outcomes than face-to-face delivery. However, that study also found that a ‘blended’ mode of education delivery – involving both online and face-to-face delivery – resulted in even better student outcomes.<sup>5</sup>
- 4.5 This chapter will examine the capacity of the NBN to contribute to educational outcomes at all levels. It begins by discussing the ability for high-speed broadband to improve classroom-based education in schools, TAFEs, universities and other institutions; then looks at the range of opportunities presented by the extension of high-speed broadband to homes and businesses. Finally, it discusses the potential for the NBN to contribute to a more efficient and effective education system.

## Enhanced classroom-based education

- 4.6 AICTEC’s submission explained that educational institutions have ‘enterprise’ rather than ‘consumer’ requirements,<sup>6</sup> meaning they need very high quality and scalable connections in order to maximise the potential of broadband for students and teachers:

In general terms educational institutions are not like surrounding residential users. One educational enterprise connection may support 1000 or more users (students, teachers and administrative staff) capable of generating as much traffic as 1000 homes. Educational institutions also have different needs to residential consumers – educational institutions require high symmetry and high bandwidth, they have low latency and peaks in demand. Connectivity between institutions is important, in addition to connectivity to external sources such as the Internet. Educational needs require access to capacity at a reasonable price to enable permanent networks to be created and to cater for the potential

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4 DBCDE, *Submission 215*, p. 43.

5 *Committee Hansard*, Canberra, 4 March 2011, p. 38.

6 AICTEC, *Submission 124*, p. 14.



increase in demand which is likely to result as innovations are more widely adopted.<sup>7</sup>

- 4.7 Currently, the quality of data connectivity varies greatly between schools. In 2010, 63.4 per cent of schools reported using fibre for their data connectivity, 32.8 per cent used copper, and the remainder used satellite or wireless. This compares with 2008 figures of 47 per cent fibre and 42.3 per cent copper.<sup>8</sup> This increase can largely be attributed to the 2010 completion of the NSW Government's rollout of fibre to all public schools and TAFEs.<sup>9</sup>
- 4.8 However, access to fibre connections has not always resulted in fast broadband for schools. Although the majority of schools now have fibre connections, 43.6 per cent of all schools still only receive download speeds of 4 Mbit/s or less, and 52.6 per cent receive 5 to 20 Mbit/s. Furthermore, access to fast download speeds is geographically patchy, with 78.4 per cent schools in remote areas receiving speeds of 4 Mbit/s or less, compared to 33.9 per cent in metropolitan and 51.4 per cent in provincial regions.<sup>10</sup>
- 4.9 Connectivity to TAFE institutions is similarly variable. According to a 2010 survey, while around 80 per cent of TAFE institutes had fibre connections, 78.3 per cent received download speeds of less than 20 Mbit/s.<sup>11</sup>
- 4.10 Given the needs of schools and TAFEs to serve large numbers of users simultaneously, these speeds are clearly not sufficient to maximise the potential of broadband. AICTEC told the Committee that the reasons most schools and TAFEs are unable to maximise the potential of their fibre connections are a lack of affordable prices for data and limitations in state-wide contractual arrangements. Volume-based charging is a common feature of these arrangements, and this is particularly difficult for schools to manage as it 'reduces their ability to control their budgets'.<sup>12</sup>
- 4.11 AICTEC explained that cost is an issue in regional areas more than metropolitan areas, with the cost of broadband connectivity in regional

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7 AICTEC, *Submission 124*, p. 6.

8 AICTEC, *Submission 124*, p. 10.

9 The Hon Verity Firth, Minister for Education and Training, 'Schools Benefit From New Broadband Network', *Media Release*, 9 September 2010  
<[https://www.det.nsw.edu.au/detresources/Broadband\\_network\\_zQlzTHKMPO.pdf](https://www.det.nsw.edu.au/detresources/Broadband_network_zQlzTHKMPO.pdf)>  
viewed 2 July 2011

10 AICTEC, *Submission 124*, p. 10.

11 AICTEC, *Submission 124*, p. 11.

12 AICTEC, *Submission 124*, pp. 14–15.

Western Australia being up to 220 times that of Perth. As a result, advanced applications, such as real-time video-conferences, ‘lie far beyond what is generally affordable or possible’.<sup>13</sup>

- 4.12 Dr Terry Percival, Director of Broadband and the Digital Economy at National ICT Australia (NICTA), further expressed his disapproval of the current fibre pricing models for schools:

I think all New South Wales high schools now have an optical fibre connection into them – sorry, the public ones, not the private ones – but a lot of them are throttled down to 10 megabits per second because of the cost, which is absolutely insane because it actually costs money to put the box on the end that throttles down the speed.<sup>14</sup>

- 4.13 Universities, on the other hand, are generally well-served, with large campuses currently receiving fibre-based connections of up to 10 Gbit/s through AARNet, Australia’s Academic and Research Network. However, many smaller and more remote university campuses, including Charles Darwin University in Darwin, fall outside AARNet’s fast network backbone and therefore are precluded from certain types of data-intensive academic activities.<sup>15</sup> This is further discussed in Chapter 7 on research and innovation.

## More educational institutions connected

- 4.14 As discussed in Appendix A, the NBN will provide fibre-optic connections to 93 per cent of Australian premises, primarily in towns and cities with more than 1000 premises. Included in this will be many schools, universities, technical colleges and other educational institutions. The NBN therefore has the potential to connect with fibre a large number of additional educational institutions that previously could not access fast broadband, particularly in regional areas. Furthermore, due to the NBN’s uniform national wholesale pricing structure, institutions in regional areas can expect to be able to connect to fibre at costs comparable to metropolitan areas.
- 4.15 AICTEC explained in its submission that ‘it would be preferable that under the NBN fibre connections to schools (and other educational institutions) are not “shared” with a number of other customers using

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13 AICTEC, *Submission 124*, p. 11.

14 *Committee Hansard*, Sydney, 29 April 2011, p. 61.

15 AICTEC, *Submission 124*, pp. 12, 16.

something like Passive Optical Networking (PON)'. Point-to-point (PtP or P2P) fibre connections would provide the optimum level of flexibility and scalability for educational institutions.<sup>16</sup>

- 4.16 As also detailed in Appendix A, the remaining seven per cent of premises in Australia will be served by a mix of fixed wireless and satellite broadband services, with initial peak download speeds of 12 Mbit/s and upload speeds of 1 Mbit/s. The Committee notes that although this may represent an upgrade in connectivity in many cases, given the shared-bandwidth nature of these technologies and the requirement of schools to serve many users simultaneously, this amount of bandwidth is not likely to enable the same level of educational services as will be available to schools connected with fibre.
- 4.17 Nonetheless, the Committee considers that the NBN's connection of schools to fibre in a more ubiquitous and affordable way will provide a range of benefits to the delivery of classroom-based education. The remainder of this section examines some of these potential benefits.

### Richer online resources available

- 4.18 The Committee heard evidence about the potential for the NBN to enable schools and other educational institutions to access richer, more data-intensive online resources for teaching and learning.
- 4.19 For example, the amount of digitised content available online has increased rapidly in recent years. With improved broadband access, students and teachers will have greater ability to access nationally significant films, music, newspapers, journals, historic documents, oral history interviews and government records from sources such as the National Library of Australia (NLA), the National Film and Sound Archives and the National Archives of Australia.<sup>17</sup> The NLA has developed a popular online archive called *Trove*, which allows members of the public to access a wide range of digitised resources from libraries and other collecting institutions. For further information on Trove refer to Box 4.1.
- 4.20 Similarly, Museums Australia submitted to the Committee:

The most exciting impact of digitisation will be the delivery of new digital content into classrooms and homes through the National Broadband Network. Australia's diverse histories will 'come alive'

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16 AICTEC, *Submission 124*, p. 14.

17 NLA, *Submission 106*, pp. 6, 7.

in new ways, with instant access to primary sources such as the voices, images, film clips, sound recordings and documents relating to Australia's history (pre- and post-European settlement), as well as through material relating to Australia's environment, natural history, political development (democratic institutions), geography and the arts.<sup>18</sup>

**Box 4.1 Trove**

The benefits of the NBN are closely related to the content that it will deliver, and a key component of that content is the digital information that is now being collected by Australia's libraries, archives, museums and other collecting institutions. Creative use of this information has the potential to realise a wide set of benefits for the Australian community, including benefits in public information, primary and secondary education, and research.

An example of this potential is the service known as *Trove* which is run by the National Library of Australia (NLA), Australia's largest public research library. *Trove* is a free online service (<http://trove.nla.gov.au>) which allows the public, and researchers, to discover, locate and annotate collection items held by more than 1000 Australian libraries, a wide range of other collecting institutions, and major digitised book, journal and newspaper collections.

Any of the data in *Trove* can be annotated by the users, meaning that citizens are able to engage with a very large range of Australian collection items. This accords with one of the NLA's objectives, to 'explore new models for creating and sharing information and for collecting materials, including supporting the creation of knowledge by our users'.

Access to this content will be facilitated by the reliable and high speed internet access that the NBN will provide. This will benefit students, teachers, researchers and the general public in time saved to access collection material, and in a greater range of collection material being available.

Source: NLA, *Submission 106*.

- 4.21 Screenrights, and its subsidiary Enhance TV, holds an extensive archive of digital broadcast television content that it distributes for educational purposes. Screenrights told the Committee in its submission that the NBN

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18 Museums Australia, *Submission 162*, p. 4.

provides 'exciting opportunities to improve access to audiovisual educational resources for all schools, TAFEs and universities'.<sup>19</sup>

- 4.22 Dr Jill Abell, Director of Information Technology at The Hutchins School, Tasmania, gave the Committee an example of the way that access to high quality online videos of historical events can transform the learning experience:

... in government schools today you could not put a class on YouTube to be investigating Tiananmen Square history as it happened because they could only really manage one student on YouTube at a time. What high-speed broadband did for our school was allow five labs of students to be on at the same time. That is history as it happened. It is not in the textbooks. The students need to see the video to answer their questions authentically about knowing through good primary sources – through the video captured of that event.<sup>20</sup>

- 4.23 Professor Adam Shoemaker, Deputy Vice Chancellor of Education at Monash University, told the Committee about the potential to take content from digitised archives one step further using high definition simulations:

If you take that kind of model of education it means that, say, in geology where, let's face it, it used to be pretty much rocks in boxes. Some of those rocks are pretty interesting, but you have to go to the box to get them. Some of them do not exist in nature anymore. They have been mined out. So if you have a digitisation strategy which is able to show this rock that no longer exists out there in the field, fluoresce it, split it apart and look at the colour and everything else, people then learn a lot more about history, archaeology, mining, mining engineering. The same information can be beamed out to people who are looking for deposits in, say, practical ways in the outback. Given the mining industry's importance in Australia, we see that as being pretty significant. That is the kind of simulation model that works at the moment. Schools can do it, universities can do it, TAFEs can do it. Irrespective of the level of education – it is the technology that is important.<sup>21</sup>

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19 Screenrights, *Submission 65*, p. [2].

20 *Committee Hansard*, Hobart, 11 March 2011, p. 49.

21 *Committee Hansard*, Melbourne, 18 March 2011, pp. 19–20.

- 4.24 Mr Stuart Hamilton AO, Chief Executive Officer of Open Universities Australia (OUA), told the Committee about a project to develop a 3D animated 'virtual world' using real archaeological information:

It is actually a 3D simulation of ancient Kashgar [Western China] to enable students to get a sense of what it was like to be in that city – a sort of second-life approach. To get that to come to life requires that breadth of broadband technology and that quick delivery. It is at the cutting edge of what is now actually being done.<sup>22</sup>

- 4.25 Mr Hamilton also told the Committee about the wide use of the 'Second Life' 3D virtual world application in the university sector, which already benefits from fast broadband:

We did a survey a couple of years ago, and certainly all of the OUA partner universities have a presence in Second Life. So they will have an island. Some of them are doing different things. For example, Swinburne has a very active teaching island, so they have a whole bunch of classrooms where they will do tutorials, lectures, et cetera. Others have a more showcase kind of island, where they will let some of their engineering students, for example, build buildings as projects in and of themselves to showcase their work. So they are not functional but they are an example of a student producing their project work in a 3D environment.<sup>23</sup>

- 4.26 These examples represent just a few of the applications that fast broadband connections to educational institutions will make possible. Over time, it is likely that many more new and innovative educational applications will be developed.

## Remote linkage to experts and institutions

- 4.27 Another way the Committee was told educational institutions could benefit from the NBN is through the ability to link up with distant locations using two-way interactive, high definition video and audio. This will enable students to listen to lectures, ask questions, take part in events, and 'visit' institutions such as museums and theatres without leaving their classroom.

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22 *Committee Hansard*, Melbourne, 18 March 2011, p. 3.

23 *Committee Hansard*, Melbourne, 18 March 2011, p. 8.

- 4.28 The Hutchins School in Hobart is an example of an independent school that already benefits from a high speed fibre broadband connection due to its proximity to the University of Tasmania. As discussed in Box 4.2, the Committee heard that this connectivity allows the schools to link up with experts around the world.

**Box 4.2 The Hutchins School**

The Hutchins School is a K-12 independent boarding school in Hobart. Dr Jill Abell, Director of Information Technology, told the Committee that the school has invested in a fibre link that allows it to connect to a nearby 1 Gbit/s AARNet service at the University of Tasmania.<sup>1</sup> Dr Abell said that Hutchins regularly uses its connectivity to connect up with experts around the world:

*There is so much to learn having a global perspective and striving for a world-class curriculum. The AARNet afforded the access to remote experts and researchers in museums, galleries and cultural institutions around the world. The ability of AARNet to deliver those world experts, scientists and researchers in Australian and international organisations face-to-face through video-conferencing has been a huge bonus to the school, and the students are very, very engaged in it. They love to use the high-definition television video-conferencing to connect with classrooms around the world.*

Dr Abell also noted that the affordance of high-speed bandwidth has had significant benefits for students at home. The increased capacity of the NBN will enhance the ability of students to access the school's virtual learning environment after hours and also a range of services provided by the school.

Source: *Committee Hansard*, Hobart, 11 March 2011.

- 4.29 Questacon, the National Science and Technology Centre, is one institution to which The Hutchins School has linked up its classrooms on a number of occasions.<sup>24</sup> Questacon delivers science communication programs to schools around Australia, and it expects the NBN will increase the ability of schools to access these programs, particularly in regional and remote communities.<sup>25</sup> The Department of Innovation, Industry, Science and Research (DIISR), within which Questacon is administered, stated:

The NBN will allow the delivery of high definition real-time interactions with Questacon presenters, scientists and

24 *Committee Hansard*, Hobart, 11 March 2011, p. 48.

25 DIISR, *Submission 219*, p. 12.

international experts through video-conferencing. The Questacon video-conferencing experience is already far more dynamic than conferencing configurations currently seen within industry, government or education.

Questacon's digital studio supports multiple inputs allowing presenters to appear to be anywhere in the solar system or within the human body to aid the learning experience. Presenters using the studio can vary the way they interact with students. This flexibility can result in a program with a live television look and feel that can also be actively participated in by students.<sup>26</sup>

4.30 Professor Graham Durant, Director of Questacon, told the Committee that Questacon is even exploring the possibility of enabling school groups to connect with surgeons performing live heart operations. The plan is based on a similar program in New Jersey in which high-bandwidth, low-latency connections allow students to talk with the surgeons as they work.<sup>27</sup>

4.31 The Council of Australasian Museum Directors submitted that museums are changing the way they interact with school students:

For generations, museums have played a valuable role in schools education. The traditional school museum excursion has enhanced classroom routine and provided opportunities for new learning experiences for students and teachers alike. Museums take a keen interest in supporting effective pedagogy in the exhibits, experiences and activities that they offer their school visitors. Just as education in schools is undergoing a digital revolution, the school museum visit has also changed into something richer and more interactive and which extends beyond the physical into virtual spaces.<sup>28</sup>

4.32 Museums Australia provided a glimpse of how these new forms of interaction might work:

Educators working in museums and cultural institutions would be able to interact virtually with school and university audiences and cultivate forums for exploring topics in more depth and from varying perspectives. Primary, secondary and tertiary students would be able to ask questions of the educators and receive an immediate response to their questions. Such sessions could be recorded and then downloaded by visitors to museums and

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26 DIISR, *Submission 219*, p. 13.

27 *Committee Hansard*, Canberra, 6 July 2011, p. 7.

28 Council of Australasian Museum Directors, *Submission 168*, p. 8.



cultural institutions through on-line access within these institutions.<sup>29</sup>

- 4.33 The Music Council of Australia told the Committee in its submission that the NBN offers many opportunities for music education, particularly through the use of two-way, high definition video and audio. Examples provided include the ability for students receive lessons from music professionals remotely, to audition online, to view live performances, to take part in interactive workshops and to share and collaborate on performances with other students.<sup>30</sup> Refer to Box 4.3 for information on the 2011 'YouTube Symphony Orchestra' event in Sydney, in which some of these possibilities were demonstrated.
- 4.34 NICTA told the Committee that the NBN would enable a new learning paradigm in which, for example, a maestro could deliver a 'master class' to music students across Australia, or similarly, an Academy Award winning actor could provide a master class to drama students in the outback.<sup>31</sup>

**Box 4.3 YouTube Symphony Orchestra**

The YouTube Symphony Orchestra is one of several collaborative efforts by YouTube to 'push the boundaries of music, art, and film'. YouTube Symphony Orchestra is an example of the convergence of online video with more traditional art forms.

From 14-20 March 2011, Sydney became only the second city in the world to host the international YouTube Symphony Orchestra. The 97 members and four soloists who made up this orchestra in 2011 included amateur and professional musicians, students and teachers and some who had never set foot out of their home country. Auditions were conducted by the musicians posting videos on You Tube.

The performances were streamed live from the Sydney Opera House around the world and the focus of the orchestra was to celebrate musical education, from online master classes with orchestras and leading international musical leaders, to classes and improvised sessions for musicians during the summit week.

Source: Time Out Sydney, 'YouTube Symphony Orchestra', 14-20 March 2011  
<<http://www.au.timeout.com/sydney/music/events/23873/youtube-symphony-orchestra>> viewed 9 August 2011.

29 Museums Australia, *Submission 162*, p. 4.

30 Music Council of Australia, *Submission 148*, pp. 4-5.

31 NICTA, *Submission 198*, pp. 16-17.

## Sharing and interacting with other schools and campuses

4.35 The improved broadband connectivity provided by the NBN will increase the ability of schools (and other educational institutions) to share resources and interact with each other.

4.36 Professor Ian Atkinson, Director of eResearch at James Cook University (JCU), told the Committee that JCU has been using shared lectures between its two geographically separated main campuses for a long time. As the university's connectivity improved it began to offer better quality video-conferencing, and the level of complaints from students declined. Professor Atkinson told the Committee that it is essential that the lecturer is able to see the students and the students be able to ask questions for the remote lecture to be successful.<sup>32</sup>

4.37 Dr Abell told the Committee that, thanks to its superior connectivity, the Hutchins School is already sharing and collaborating with other independent schools, and there is an appetite within the school system for this type of interaction to increase:

We have the capacity now for our school to be connected with other independent schools around Australia to share and have those collaborative classrooms ... The networks have existed in the tertiary education sector for a long time and have had great benefits for economics and commerce in Australia. That is what schools are now asking for. Schools want to be connected.<sup>33</sup>

We now have a situation with some of the independent and Catholic schools around Australia where we share a lesson ...

We share those lessons with the independent schools that are also AARNet members around Australia. We have a manager who looks at each education outreach for those schools on AARNet and gives us a heads-up on any cultural or research organisation around Australia like CSIRO, the museums, the universities who are willing to put their experts face-to-face with our students.<sup>34</sup>

4.38 The NBN will also provide opportunities for schools to increase their links to the tertiary sector. Professor Shoemaker of Monash University told the Committee about some of the benefits for schools who can access university networks:

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32 *Committee Hansard*, Townsville, 19 April 2011, pp. 6-7.

33 *Committee Hansard*, Hobart, 11 March 2011, p. 45.

34 *Committee Hansard*, Hobart, 11 March 2011, p. 48.

... we have a secondary school on the Monash Clayton Campus called the John Monash Science School, and another one on our smaller Berwick Campus. In fact, these schools get all the benefit of the superbroadband that the university has at present – all of its material, its laboratories, its students, its connections, even its library and online access. The other schools in the community do not have that access. Even though we would love them to, the actual fact that they are within this, if you like, digital tent makes a huge difference. We would like to see equity in education across the sector ... You can see the potential for those who are able to access it versus those who are not. They are classrooms of the future ...<sup>35</sup>

## Access to more curriculum options

- 4.39 The Committee heard that increasing links between schools campuses and other educational institutions will allow students in smaller institutions, particularly in regional and remote areas, to take part in subjects that were previously unavailable to them. Regional Development Australia (RDA) Far West NSW submitted to the Committee:

Our region wants improved education and training ... but time after time services are unavailable or lost due to lack of critical mass of students or teachers ... Only courses with popular student demand can be offered 'in person'. There are huge possibilities to extend the available courses on offer to any that can be packaged into online, video environments. The NBN potentially could allow students in the region to access any tertiary courses anywhere in the country.<sup>36</sup>

- 4.40 Language education is one example of a subject area where the range of options for students is currently limited, but could be improved by high speed broadband facilitating interactive video-conferencing and 'virtual classes'. Dr Evan Arthur, Chair of AICTEC, told the Committee:

I note there is an institution starting up now in Australia which is going to exploit the fact that you have a number of people in Australia who are interested in learning a foreign language. We happen to be in the same time zone as large numbers of people who happen to be native speakers of those languages. That is something which becomes possible when you solve a number of

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35 *Committee Hansard*, Melbourne, 18 March 2011, pp. 18–19.

36 RDA Far West NSW, *Submission 127*, pp. 3–4.

things of which an appropriate, capable, scalable and affordable telecommunications provision is a very important part.<sup>37</sup>

- 4.41 The university sector is already benefiting from these types of cross-institutional arrangements, and with the NBN opportunities will increase for students at regional campuses to access more courses. Professor Atkinson of JCU told the Committee:

It may mean that universities can progress down this path of specialisation so that if a particular student in a regional location really does want to study a particular niche area of some discipline that their local university cannot provide they can study that at other universities. In fact, we have courses being delivered now that are being taught from Townsville into Newcastle and Flinders University, I think, and there will be similar reciprocal arrangements.<sup>38</sup>

- 4.42 Professor Shoemaker told the Committee about how broadband links between Monash's local campuses and its Malaysian campus have created the opportunity for students to undertake courses that are not otherwise available in Victoria:

... the Malaysia site is actually a fully-fledged accredited campus with its own medical school, engineering school and so on. But the key to this is that there is no tropical terrestrial biology in the state of Victoria. There is in Malaysia and it is actually very relevant to future planning in all sorts of things – as you know, we are currently seeing terrible weather events in the world and so on. So this is actually a key. Half the students are from Australia, half are from Malaysia. They work bilingually as well, so there is Malayan English happening. They work in real-time and there is also an on-site visit for them in Malaysia. They are able to use our campus network to make it happen.<sup>39</sup>

## Increasing student and teacher retention in rural areas

- 4.43 A number of submitters told the Committee that the availability of better online education resources could lift school retention rates in rural areas and reduce the need for young people to relocate to cities to access

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37 *Committee Hansard*, Canberra, 4 March 2011, pp. 65–66.

38 *Committee Hansard*, Townsville, 19 April 2011, p. 4.

39 *Committee Hansard*, Melbourne, 18 March 2011, p. 19.

education opportunities.<sup>40</sup> For example, the Committee heard that due to its dispersed population, Tasmania has one of Australia's lowest rates of school student retention after year 10.<sup>41</sup> Ms Melinda King, Research Officer at the Tasmanian Farmers and Graziers Association, told the Committee that better online education could create more opportunities for Tasmanian students to stay in their home communities:

... not many of our high schools go to year 12. With a lot of the rural areas the kids have to come into town to do years 11 and 12 – to either Hobart, Launceston, Burnie or Devonport. That is a big move for a 16-year-old child. It is a big expense given the vagaries of farming. Education is such an easy thing to get online now if you have got a good connection and can do it quickly. For that matter, it can keep families together and it takes that pressure off.<sup>42</sup>

4.44 AgForce Queensland put forward a similar proposition:

AgForce recognises that now, more than ever, there is a need to retain youth in rural areas. By delivering broadband to rural communities, access to education beyond compulsory schooling years may positively counteract the exodus of youth from the bush.<sup>43</sup>

4.45 The Committee was also told that the NBN could improve the rates of teacher retention in rural areas. The Northern Territory Government submitted:

The virtual class room means that expert teaching skills can be provided to a number of small remote communities simultaneously. In an environment where it is difficult to source teachers and retain them, the NBN offers the potential to reduce turnover in teaching staff in remote communities, where remote won't seem so remote when friends, family and pastoral support are just a video-conference click away.<sup>44</sup>

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40 For example: Bass Coast Shire Council, *Submission 130*, p. 2; RDA South West, *Submission 149*, p. 3; Sunshine Coast Regional Council, *Submission 188*, p. [4]; Port Stephens Council, *Submission 223*, p. 3; Mr Daniel Brinkworth, ICT Manager, City of Victor Harbor, *Committee Hansard*, Victor Harbor, 5 April 2011, p. 6.

41 Ms Melinda King, Research Officer, Tasmanian Farmers and Graziers Association, *Committee Hansard*, Launceston, 10 March 2011, p. 44; Mr Robert Wallace, Chief Executive Officer, Tasmanian Chamber of Commerce and Industry, *Committee Hansard*, Hobart, 11 March 2011, p. 16; Dr Abell, The Hutchins School, *Committee Hansard*, Hobart, 11 March 2011, p. 49.

42 *Committee Hansard*, Launceston, 10 March 2011, p. 44.

43 AgForce Queensland, *Submission 24*, p. 8.

44 Northern Territory Government, *Submission 209*, pp. 3–4.

## Enhanced education outside the classroom

- 4.46 By making broadband available to all Australian homes and businesses, including high-speed fibre connections to 93 per cent of premises, the benefits of the NBN to education are not limited to classroom-based educational experiences. The Committee was informed about a wide range of educational services that students and teachers will be able to access from their own homes and workplaces. This section will examine some of the general aspects of the increased capacity the NBN will provide, then examine some of the specific types of applications that will be made possible for education in the home, workplace and community.

### The benefit of ubiquity

- 4.47 The Committee heard that existing online education services are limited in their availability due to the ‘patchy’ nature of broadband connectivity, particularly outside the major cities. For example, OUA told the Committee it limits its marketing in rural areas because it knows ‘the promise cannot actually be delivered in all cases’.<sup>45</sup>
- 4.48 Professor Shoemaker of Monash University told the Committee that the current lack of ubiquitous fast broadband, even in major cities, results in inequity of opportunities for its students:

Here is the thing. The latest figures we have are that 60 per cent of our students have a device of their own, about 35 per cent of our students share something in the home ... and five per cent of our students have nothing at home ... The ones who come in with a device are on one speed, the ones who only share a device at home are on another speed and the ones who have nothing are on a third speed. We want to find a solution to the problem for everyone.<sup>46</sup>

- 4.49 Education providers are also limited in the services they are able to provide due to the inherent limitations of copper-based infrastructure. Mr Hamilton noted:

We are right now pushing at the limits of what can be delivered, so there is a demand push as well as, if you like, a supply pull operating at the same time. We are a sort of getting to the limits. Right now, anything that can be delivered is probably accessible

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45 Mr Hamilton, *Committee Hansard*, Melbourne, 18 March 2011, p. 4.

46 *Committee Hansard*, Melbourne, 18 March 2011, pp. 26–27.

by people in an inner-city situation, but it is much harder in more rural and remote areas.

... the copper network has been exploited beyond its real capacity and indeed its use-by-date. OUA is expecting significant barriers to the expansion of the learning advances of its partnership if the replacement is not planned and implemented soon.<sup>47</sup>

- 4.50 As noted in Chapter 2 on government services, this issue can be described as a 'lowest common denominator approach',<sup>48</sup> leading to services being restricted in their quality in order to maximise their accessibility. Professor Atkinson of JCU told the Committee that ubiquity of broadband access would enable more innovative online education solutions to be developed:

The point for us is that it will be every student who will have access to this technology. That is really the difference. Some of these things can be done now to different people in particular different locations, but you cannot rely on people having access to that. Without that, it really makes the investment rather more difficult to justify and so on, whereas because of the ubiquity of this we think that it is going to create a lot of commercial opportunities for people to come up with good solutions to those problems that we can then innovate on top of.<sup>49</sup>

### Richer, more interactive online educational services

- 4.51 Mr Hamilton told the Committee that faster connections to homes and workplaces would allow more face-to-face interaction to be incorporated into OUA's educational programs. This would not only enhance the quality of course material but, by increasing the social aspect of online learning, could attract a wider range of students with different learning styles:

The key to us is speed of interactivity. It is not just a matter of passively presenting content; it is a matter of providing an environment online which enables real learning – interactive learning – between students and tutors and between students so that there can be chat and engagement in interactive technologies, whether it is virtual reality or responding to things as they are happening ...

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47 *Committee Hansard*, Melbourne, 18 March 2011, pp. 3–4.

48 *Adult Learning Australia, Submission 163*, p. [1].

49 *Committee Hansard*, Townsville, 19 April 2011, p. 4.

From our market research into people who are interested in studying ... one of the main things that they talk about when they say that they are not sure that it is for them is that sense that they have to study by themselves without any help from interaction with other students. If we are able to publicise that this is actually a very social experience then ... we can conclude that it is likely to be attractive to a wider range of students.<sup>50</sup>

- 4.52 Similarly, Professor Atkinson told the Committee that high-quality broadband-enabled video-conferencing would enable interactive learning to take place in the form of realistic ‘virtual classes’:

With this high-quality multipoint video-conferencing it is no problem to get 20 people together in a single virtual space. You can see everyone in high quality. You can interact with them just as naturally as we are now face-to-face and you can build these relationships, better support networks, better learning outcomes and better opportunities.<sup>51</sup>

- 4.53 Mr Rod Tucker, Director of IBES, advised the Committee that this type of two-way, interactive video service would require as much upload speed as it would download speed. Speeds of up to 20 Mbit/s would be required in both directions for homes to take part in high quality video-conferences.<sup>52</sup>
- 4.54 IBES also submitted that 3D virtual reality simulations with ‘haptic’ (sense of touch) feedback could be incorporated into education to teach students complex skills, including surgical procedures.<sup>53</sup>
- 4.55 Conversely, Mr Hamilton told the Committee about ‘augmented reality’, which is a type of educational technology that is ‘basically the other way around’ from simulated virtual reality. In augmented reality, the real world is supplemented with additional educational information from the virtual world. For example, students walking around a real environment would be fed a stream of information through a mobile device as they look at things like historical buildings.<sup>54</sup> CSIRO advised that augmented reality systems typically require data rates of 20 to 100 Mbit/s.<sup>55</sup>

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50 *Committee Hansard*, Melbourne, 18 March 2011, pp. 2, 6.

51 *Committee Hansard*, Townsville, 19 April 2011, p. 4.

52 *Committee Hansard*, Melbourne, 18 March 2011, p. 33.

53 IBES, *Submission 84*, p. 5; University of Melbourne, *Submission 120*, p. 5.

54 *Committee Hansard*, Melbourne, 18 March 2011, p. 7.

55 CSIRO, *Submission 171*, p. 10.



4.56 Another new mode of teaching that will become increasingly available online with the NBN is game-based learning. OUA explained in its submission:

Game-based learning has grown in recent years as research continues to demonstrate its effectiveness for learning for students of all ages. Games for education span the range from single-player or small-group card and board games all the way to massively multiplayer online games and alternate reality games.<sup>56</sup>

4.57 The Committee was also made aware of video game technology being applied in the defence sector, with a local company having developed 'virtual ship' simulations that replicate real naval vessels for training purposes. Up to 100 personnel at any one time are able to participate in simulated training exercises on the ship using 3D animated avatars, from anywhere in the country.<sup>57</sup>

4.58 A number of witnesses and submitters noted that the NBN will provide opportunities for Australia to develop broadband-enabled educational tools that could be exported to other parts of the world.<sup>58</sup> Moreover, Dr Kate Cornick, Executive Director of IBES, told the Committee that such education models as the University of Melbourne's UniTV could help improve Australia's standing as a destination for international students:

... I think those sorts of models have the potential to improve Australia's international competitiveness because it is not just about the individual productivity of a student and their experience; it is also positioning Australia as an education centre for other countries to seriously consider sending their children and students and potentially keeping them at their homes in China or wherever else they may be located. So there are real opportunities that broadband could offer in that area.<sup>59</sup>

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56 OUA, *Submission 183*, p. 6.

57 DIISR, *Committee Hansard*, Canberra, 6 July 2011, p. 10; See also The Hon Jason Clare MP, Minister for Defence Material, 'Avatars train on Navy's future ship', *Media Release (MIN56/11)*, 11 June 2011.

58 TAFE NSW North Coast Institute, *Submission 59*, p. [2]; Communications Alliance, *Submission 185*, p. 15; Professor Atkinson, JCU, *Committee Hansard*, Townsville, 19 April 2011, p. 4.

59 *Committee Hansard*, Melbourne, 18 March 2011, p. 32.

## Education at home

- 4.59 The Committee heard that the NBN will enable a variety of educational activities to take place in the homes of students, leading to wide-ranging benefits. Some of these activities are discussed below.

### After hours home education

- 4.60 With high-speed broadband available in homes across Australia, the Committee heard that students and teachers will be able to access online school resources outside normal contact hours, supporting their classroom-based education. SAIC Pty Ltd observed that:

Connecting schools and classrooms are important, but student learning and creativity needs to be supported at home. Students need access not only to the same resources they have at school, but they need to be able to ‘pick up where they left off’ in the learning process when they get home. That means that computers in the home need to meet the same technical specifications as the computers in the school.<sup>60</sup>

- 4.61 In its submission, the ACT Government told the Committee about its innovative ‘connected learning community’ (cLc) program which enables students to participate in a range of school-based activities from home:

The cLc system delivered from ACT schools' high-speed fibre infrastructure is a safe online learning community for students to interact with their school and one another. The cLc system allows students to replay a lesson at home via podcast, use video links to practice speaking a language with a student at another school and have the option of completing their maths homework online. Students will also be able to log in from home to double check their homework requirements and create online portfolios of work. Video-conferencing amongst students and teachers is also currently being integrated into the cLc. Without optical fibre based broadband – the fastest, most effective way for schools to access online content functionality – access to the cLc would be limited.<sup>61</sup>

- 4.62 Ms Aisha Trueman, a year 11 student in Canberra, expressed support for the NBN’s role in increasing the ability of students to access resources from home in light of increasing expectations from schools:

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60 SAIC Pty Ltd, *Submission 35*, p. 8.

61 ACT Government, *Submission 227*, p. 7.

School students are more and more frequently being given homework assignments with the assumption that they have internet access of a reasonable speed so that they can do effective internet research, but not all students have internet like this, if any. This makes the assignments difficult for them, but it is also difficult for the schools to compensate for students like this. The NBN means that students will have fast internet and thus school and teachers can set assignments with this in mind, making for faster, more up-to-date education.<sup>62</sup>

- 4.63 DBCDE told the Committee about some other innovative ways in which the NBN could transform home-based education, including enabling commercial tutoring providers to deliver live tutoring online to students at home and high level 'virtual classes' for gifted and talented students to supplement their school studies.<sup>63</sup>

### Involvement of parents in children's education

- 4.64 Broadband internet provides an opportunity for parents to be more involved in the education of their children. Dr Arthur of AICTEC told the Committee that a fibre network would enable the interaction between parents and schools to develop further:

More detailed interactions involving parents, where parents could be aware of some of the experiences via particular educational activities that students are engaged in and the family can be also involved in those things, do require levels of connection. In particular, if you are having educational experiences involving parents and doing things generally outside the institution, one of the key aspects of fibre that is relevant is its symmetrical nature. If you have people at home doing a lot of applications which require them to interact with the institution, then the same or similar amounts of traffic need to move interactively between the two. At the moment fibre is the technology you would choose to enable that.<sup>64</sup>

- 4.65 Dr Abell told the Committee that The Hutchins School already conducts parent-teacher meetings using video-conferencing, including with parents overseas.<sup>65</sup> Dr Abell also said:

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62 Ms Aisha Trueman, *Submission 88*, p. 2.

63 DBCDE, *Submission 215*, p. 49.

64 *Committee Hansard*, Canberra, 4 March 2011, p. 58.

65 *Committee Hansard*, Hobart, 11 March 2011, p. 47.

Typically of independent schools, we place great importance on a parent portal, so the parents are able at any time to connect to the school to see their children's timetable, their children's performance, ongoing formative assessment, the celebration of their work through their e-portfolios, or just to make a time with the teachers to go to a parent-teacher meeting, et cetera. It is the ability of the school to have fast, secure, reliable communications to allow the home to connect.<sup>66</sup>

### Participation by students who can't make it to class

4.66 The ability of the NBN to supplement school-based education has been discussed; however, for many students, attending school in person is not possible for a range of temporary and permanent reasons, such as work responsibilities, illness, disability, or being located in a remote area. The Committee received evidence that the NBN may be able to help such students keep up with their studies and maintain contact with their teachers and fellow students from home, for example, by enabling them to view missed lectures online or attend virtual classes. The potential would be equally as great for parents who choose to home-school their children.

4.67 The Australian Information Industry Association (AIIA) advised the Committee that the benefits of NBN-enabled educational services for people who are not able to attend classes in person are vast:

The ability to facilitate virtual classrooms and even virtual schools provides unimaginable opportunities for students otherwise excluded from the physical school community. This includes those in isolated geographic locations but also those otherwise socially isolated by way of disability or circumstance (e.g. carers of people with disability, seniors, mature aged workers, migrants, stay at home parents etc). For some of these groups the ability to participate in education and training has not been an option. For others their specialist teaching needs have simply not been able to be met ... Ultimately the payoff is improved workforce opportunities and participation – and in turn increased productivity.<sup>67</sup>

4.68 Professor Atkinson from JCU told the Committee that students who both work and study are increasingly expecting to be able to interact with universities online:

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66 *Committee Hansard*, Hobart, 11 March 2011, p. 41.

67 *AIIA, Submission 184*, p. 13.

Most people in this room, or many of us, when we went to university we would probably have attended full time. That is now becoming the exception rather than the norm. Students are working part time ...

To have the NBN reticulated into these businesses where students in their breaks and so forth can interconnect with material and content from the universities is I think going to provide better mechanisms for those students to interact electronically with the university ...

... where I think it is going to impact is that students will be able to access those lecturers more or less from wherever they are ... You have students out on particular placements or they are working for a business and the business has particular demands on them. They can actually just beam in from that business or from home, or if they are in a different city, an interconnect to those lectures in that fairly natural way through desktop video-conferencing tools that are now becoming of course almost free.<sup>68</sup>

- 4.69 Similarly, the NBN will enable students who cannot attend classes because they are ill to be able to continue their education. Mr Gary Ballantyne, Account Director NBN at Huawei, gave the Committee an example of how the NBN would enable students to keep up with their studies during an epidemic:

There was a very good example a couple of years ago where all the schools in France were closed for about three weeks because of a swine flu epidemic. The government there was very keen to find some way to continue the education of the French students during that period while the schools were closed and they were looking for some ubiquitous network that would enable them to be able to reach the vast majority of kids. They just did not have it and ended up doing some classes over cable TV.<sup>69</sup>

- 4.70 In its 2008 report, the Rural Telecommunications Independent Review Committee (RTIRC) noted that 'distance, population size and resource constraints require some curricula to be delivered remotely rather than face-to-face' in many rural areas. It went on to say that 'the provision of adequate telecommunications services can change the way people learn and provide the flexibility required to accommodate different needs,

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68 *Committee Hansard*, Townsville, 19 April 2011, pp. 3, 6.

69 *Committee Hansard*, Sydney, 29 April 2011, p. 14.

preferences and constraints'.<sup>70</sup> Students in remote areas who are not within practical distance of a school have relied on distance education programs such as School of the Air for their education needs for many decades. The opportunities for students in remote areas could be considerably enhanced by the NBN.<sup>71</sup> AgForce Queensland submitted:

Broadband is desirable for remote/distance education as it allows for fast download times and enables participation in interactive programs. Its efficacy for self-directed learning is unrivalled, with many part-time and external students at tertiary institutions reliant upon internet access for their studies.<sup>72</sup>

- 4.71 McKinlay Shire Council submitted that the NBN could, by improving the quality of distance education, decrease the need for families in remote areas to send their children to boarding school:

Access to the NBN will provide students with web based interactive lessons involving real-time voice and data transmission. With the NBN it is a possibility that secondary education via the internet could be reintroduced as an educational alternative for parents preferring to home-school, rather than having their children attend boarding school. With the ever advancing online applications and web sites, the NBN will be imperative for education and skill building as we move further into the technological age.<sup>73</sup>

- 4.72 Physical Disability Australia advised the Committee about the potential of the NBN to improve access to education for people with disabilities who would otherwise have difficulty attending school:

Many people with disability experience discrimination at learning institutions such as lack of accessible premises, not being able to travel to and from learning institutions because of costs and lack of accessible public transport as well as time factors.

Learning online has become the way of the future, and through the Internet, people with disabilities are able to access education and

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70 Regional Telecommunications Independent Review Committee, *Framework for the Future*, September 2008, p. 32.

71 See Mr Daniel Bryar, *Submission 96*, p. [3]; Optus, *Submission 179*, p. 8; DBCDE, *Submission 215*, p. 47.

72 AgForce Queensland, *Submission 24*, p. 8.

73 McKinlay Shire Council, *Submission 31*, p. [2].

vocational opportunities that would otherwise not be available, therefore increasing employment opportunities for the future.<sup>74</sup>

- 4.73 The Music Council of Australia told the Committee that disability services are specialised and only available from a small number of locations, so the disabled community could particularly benefit from NBN-enabled services being delivered directly to the home.<sup>75</sup> For example, the Australian Federation of Deaf Societies (AFDS) submitted that the deaf community would benefit greatly if educational services incorporating live captioning and video relay interpreting could be delivered to the home rather than requiring students to travel to designated locations, as occurs currently.<sup>76</sup>

## Education in the workplace

- 4.74 The National Centre for Vocational Education Research (NCVER) provided data to the Committee showing that the proportion of Vocational Education and Training (VET) subjects delivered mainly online or remotely increased from 3.8 per cent in 2007 to 5.4 per cent in 2009, with the highest rates of usage in agriculture, environmental and education related fields and lowest rates in architecture and building.<sup>77</sup> However, the rate of VET sector usage is significantly lower than the higher education sector. NCVER suggests this is because VET courses tend to rely on delivery of training in the field or as part of work experience compared to higher education courses. The current limitation in bandwidth outside educational institutions is therefore limiting the capacity for VET to take place online:

VET generally relies on more experiential methods of delivery, often delivered on-the-job. The remote nature of the internet, at least in its current technological incarnation, struggles to provide an adequate replacement for the benefits of proximity-based learning.<sup>78</sup>

- 4.75 By increasing bandwidth to workplaces, the NBN has the potential to enhance VET to at least the same degree as other forms of education. AICTEC told the Committee that this will have wide-ranging benefits for the Australian economy:

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74 Physical Disability Australia, *Submission 164*, p. 4.

75 Music Council of Australia, *Supplementary Submission 148.1*, p. 8.

76 AFDS, *Submission 119*, p. [6].

77 NCVER, *Submission 131*, pp. 2–3.

78 NCVER, *Submission 131*, p. 3.

The Australian Flexible Learning Framework ... has acknowledged, as a fundamental principle, the importance of a cost effective, high speed broadband that supports flexibility in the delivery of education and training to the VET sector ... its introduction is expected to deliver social and economic benefits and drive Australia's productivity competitiveness and that for Australian business, it represents an unprecedented opportunity for innovation and radical changes to the way learning and training is conducted.<sup>79</sup>

- 4.76 Townsville City Council submitted to the Committee that the NBN would improve the accessibility of vocational training to people in regional areas and increase the amount of time they are able to spend in their own workplaces:

As a key regional centre serving a large regional catchment, Townsville is host to a number of vocational training providers. Students are often required to travel to Townsville to undertake classroom training to supplement their on-the-job learning. Increased broadband capacity, particularly in regional and remote communities, will revolutionise the way in which training is delivered and potentially allow trainees to spend more time in the workplace and less in classrooms.<sup>80</sup>

- 4.77 North Coast (NSW) TAFE told the Committee that the NBN will greatly change the way they are able to deliver training across the full range of vocations by allowing staff and students to transmit detailed images in real time, interactive video:

Being able to view 'rich media' will provide students with a greater appreciation of what is being described or demonstrated and allow them to capture assessment tasks in the workplace. Students completing complex physical tasks as part of an assessment in their work place will be able to share their work with their teacher or project team and receive real time feedback. Examples include but are by no means limited to:

- A hairdressing student (with the client's permission) will be able to make a video recording of their initial fact finding interview, then record and appraise their practical skills and conclude with an exit interview or client satisfaction assessment.

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79 AICTEC, *Submission 124*, p. 5.

80 Townsville City Council, *Submission 199*, p. 3.



- In horticulture the same technology will give us good resolution to assess the potting of nursery stock. As well, the teacher can demonstrate the skill to a remote student. Different tools such as camera glasses used in conjunction with the improved bandwidth will help the teacher to see fine detail.
- Commercial cookery students can demonstrate knife skills as they use them in their workplace. Assessors will be able to review safety, speed and the quality of the product.<sup>81</sup>

4.78 Other forms of advanced online learning are also particularly applicable to vocational contexts. For example, North Coast TAFE submitted that simulated, virtual environments could be used to teach skills for complex, hazardous or capital intensive vocations, such as fire-fighting or the operation of large machinery.<sup>82</sup> CSIRO advised that it is working on advanced training systems for aviation and mining companies that consist of augmented reality with haptic feedback.<sup>83</sup> Ms Sally Thompson, Chief Executive Officer of Adult Learning Australia (ALA), told the Committee about 'point-of-view' glasses that are worn by training participants and allow the trainer to remotely see the participant's point of view as they repair a car, for example.<sup>84</sup>

4.79 Professor Atkinson from JCU advised that the NBN will also be a support for universities as they progressively restructure their teaching and assessments towards more 'work integrated learning', in which components of a student's degree are spent embedded in a workplace:

We just do not want to throw students out into that workplace with a few pieces of paper, a couple of downloads on a DVD and let them go. Students need to be scaffolded. They need to be supported and you need to be interacting with those students in those workplaces.<sup>85</sup>

4.80 Mr Ben Vivekanandan, National Manager for Policy and Research at ACPET, told the Committee that 74 per cent of Australian VET is delivered by private institutions.<sup>86</sup> ACPET member, Mr Paul Lange, informed the Committee about his company, Accredited Online Training, which delivers vocational training around Australia using online video-conferences. Mr Lange said that two-way video is necessary for skills training in order to ensure that skills can be demonstrated, however, this

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81 TAFE NSW – North Coast Institute, *Submission 59*, p. [1].

82 TAFE NSW – North Coast Institute, *Submission 59*, p. [2].

83 CSIRO, *Submission 171*, p. 10.

84 *Committee Hansard*, Canberra, 4 March 2011, pp. 53–54.

85 *Committee Hansard*, Townsville, 19 April 2011, pp. 2–3.

86 *Committee Hansard*, Canberra, 4 March 2011, p. 37.

requires broadband connectivity at a sufficient level to prevent participants from dropping out. Mr Lange expects that the NBN will enable more participants to take place in a training video-conference at the same time, increasing the economic viability of this type of training.<sup>87</sup>

4.81 The Committee heard that the NBN will provide opportunities to enhance professional development in regional areas, including in the field of medicine.<sup>88</sup> Ms Meredith Feist, Manager of Operations and Community Engagement at Flinders University Rural Clinical School, told the Committee that the School currently uses multi-point video-conferencing for the administration and delivery of its programs in rural South Australia, however, there is a need for greater bandwidth and stability of network to enable these interactions to improve in quality.<sup>89</sup> See Chapter 3 for further information on the NBN's ability to enhance medical education.

4.82 In its recent report, the Broadband Commission for Digital Development identified that the way teaching takes place will change greatly, and a focus on teacher support is critical to ensure that the benefits of broadband for education are realised:

One of the most critical issues will be to ensure that the education system is capable of leading this revolutionary change. This will necessitate very significant professional development. Often a great deal of attention and money goes into the technology but very few resources, if any, are available to ensure that those who will have to make it work are equipped to implement and guide that process. Teachers and other staff will need significant support – without this, despite the enormous investment by the government, the project could fail.

Teaching as a profession will also change radically, as not all teachers will need to be school-based. For example, teachers who leave the formal system when they start their own families could be easily retained within a far more flexible work structure complemented by e-education.<sup>90</sup>

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87 *Committee Hansard*, Canberra, 4 March 2011, pp. 39–40.

88 Rural Health Education Foundation, *Submission 87*; OUA, *Submission 183*, p. 3.

89 *Committee Hansard*, Victor Harbor, 5 April 2011, pp. 19, 23–24.

90 Broadband Commission for International Development, *Broadband: A Platform for Progress*, June 2011, p. 112.

- 4.83 Several inquiry participants told the committee that the NBN will enable greater opportunities for access to professional development by teachers, particularly those living in rural areas.<sup>91</sup> The AIIA submitted:

The quality of educators and the opportunities available for them to access and share resources and participate in professional development activities (which ultimately make their jobs more interesting and fulfilling) are enhanced. This is particularly critical to schools and teachers that are geographically isolated who have limited access to, or flexibility to access, peer support and professional development networks. Access to such networks and to rich educational resources also provides an important incentive for teachers otherwise disinclined to seek out rural and even some regional teaching positions.<sup>92</sup>

- 4.84 Similarly, NICTA told the Committee:

It is important to ensure that teachers at all levels are able to upgrade their own skills and keep up with the latest in the education system. Using online tools and social networking, teachers are already starting to share content and teaching techniques with peers around the world. Given unfettered broadband access they will also have access to a huge variety of online learning tools and technologies.<sup>93</sup>

- 4.85 As an example of the new types of resources that could be made available to teachers in Australia, Huawei told the Committee about an online service in the United Kingdom called 'Teachers TV' (recently re-launched as SchoolsWorld.tv).<sup>94</sup> This service consists of thousands of free, high quality educational videos showing teachers how to improve their teaching skills, deliver lessons across the curriculum and deal with issues such as bullying and conflict.<sup>95</sup>

## Education in the community

- 4.86 In addition to extending education to the homes and workplaces of enrolled students, the Committee heard that the NBN could enable high

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91 For example: Huawei, *Submission 105*, p. 8; RDA Townsville and North West Queensland, *Submission 202*, p. 2; AICTEC, *Submission 124*, p. 24; DBCDE, *Submission 215*, p. 42; Music Council of Australia, *Supplementary Submission 148.1*, pp. 9–10.

92 AIIA, *Submission 184*, p. 13.

93 NICTA, *Submission 198*, p. 17.

94 Huawei, *Submission 105*, p. 8.

95 See SchoolsWorld.tv <[www.schoolsworld.tv/videos/](http://www.schoolsworld.tv/videos/)> viewed 5 July 2011.

quality online education to be made more accessible to the general public in a less formal way.

- 4.87 Adult Learning Australia (ALA) explained that its vision is for all citizens to have access to both lifelong and 'lifewide' learning:

By 'lifelong learning' we mean learning beyond school throughout the adult years via the formal education system, in workplaces and through community participation. By 'lifewide learning' we mean developing the skills and knowledge required to engage in meaningful work, to participate fully as a citizen in a vibrant democracy, to live in harmony in a diverse, multicultural and rapidly changing society and to manage ones health and personal wellbeing, particularly in the senior years.<sup>96</sup>

- 4.88 Organisations such as the University of the Third Age aim to make education accessible to older people, and online courses are now available that are particularly aimed at people who are physically, geographically or socially isolated.<sup>97</sup> During the Committee's visit to Melbourne, IBES told the Committee about the University of Melbourne's development of Uni TV, an IPTV service which will be capable of sharing the university's lectures and other content with audiences anywhere (see Box 4.4 for further information). Dr Cornick told the Committee:

Uni TV does not just offer degrees to regional areas. For example, a family in a regional area or an elderly person who is interested in microbiology could see a pre-eminent academic who might be visiting Melbourne University give a public presentation at the university which they would otherwise be unable to see. But they could tune in and see that presentation for themselves through Uni TV ...

It is the community engagement, the knowledge transfer aspects of the university that could be opened up to a broader community.<sup>98</sup>

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96 ALA, *Submission 163*, p. [1].

97 See U3A Online <<http://www3.griffith.edu.au/03/u3a/>> viewed 4 July 2011.

98 *Committee Hansard*, Melbourne, 18 March 2011, p. 32.

**Box 4.4 Uni TV**

Uni TV is an innovative new technology platform developed by the Institute for a Broadband-Enabled Society (IBES) in collaboration with Ericsson and The University of Melbourne. It aims to harness the potential of broadband in delivering tertiary education services.

Uni TV brings together a wide variety of both existing and newly created customised content from across the University of Melbourne and combines them with interactive applications such as shared learning environments and virtual workspaces. New content development can harness the potential of 3D technology in learning through the visualisation of molecular structures, artefacts and designs. End users could be educators, learners, researchers or the general public.

Platforms such as Uni TV also have the potential to improve Australia's international competitiveness by positioning Australia as an education centre for other countries.

Source: IBES, *Submission 84*; Dr Cornick, *Committee Hansard*, Melbourne, 18 March 2011.

- 4.89 Professor Atkinson of JCU told the Committee that there is a high level of demand in the community for this type of service:

There is a lot of fantastic material that is already recorded. iTunes University, an Apple product [which] has fascinating lectures, and the TED Talk series, are really popular. There is actually a demand for this sort of thing. I think you are quite right; in the University of the Third Age there are really fascinating opportunities as we engage with the ageing population. I know this from just personal experience with older people I know in my own suburb and my own parents about people wanting to keep engaged. It is harder for people to get out and so forth, but these technologies will just let them engage.<sup>99</sup>

- 4.90 Ms Thompson of ALA told the Committee that high bandwidth is essential for this type of education in order to replicate face-to-face interaction as closely as possible:

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<sup>99</sup> *Committee Hansard*, Townsville, 19 April 2011, p. 10.

For all of those activities what people really need is face-to-face interaction with other human beings, whether it is through learning, through engaging with health services or through other sorts of peer-to-peer sharing. What you find at the moment is that some people who live in remote areas or people who are confined for other reasons will persist with the technology we have; they will actually push on ... But a certain group of people just do not; they do not push past that initial point of resistance. They are the people for whom an NBN will really open up the world.<sup>100</sup>

- 4.91 ALA submitted to the Committee that social inclusion programs, such as the Federal Government's Broadband for Seniors program which funds kiosks that provide free broadband access and deliver training in basic computer and internet skills, will benefit greatly and be more attractive to participants when applications are made available that more closely mimic face-to-face interaction.<sup>101</sup>

## **A more efficient education system**

- 4.92 In addition to delivering better and more accessible education outcomes, several inquiry participants advised the Committee that ubiquitous, fast broadband has the capacity to enable education to be delivered more efficiently.

- 4.93 For example, Mr Paul Nicholls, Director of Strategic Projects, Office of Research and Development at Curtin University, told the Committee that the NBN could help to reduce pressures on physical infrastructure at university campuses such as lecture theatres, computer laboratories, parking lots and other student facilities:

Broadband services for university students will reduce the need for regular on-campus student attendance at peak times and allow the use of these resources to be targeted for specialist functions such as visiting specialists, workshops and laboratories.<sup>102</sup>

- 4.94 NICTA submitted that by using cloud services, education providers could substantially reduce their costs while providing better collaborative ICT services:

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100 *Committee Hansard*, Canberra, 4 March 2011, p. 51.

101 *ALA, Submission 163*, p. [2].

102 *Committee Hansard*, Perth, 5 May 2011, p. 19.

In 2010, Google reported that 1.2 million NSW school students' emails had been migrated to a Google App for Education, reducing total costs by 66 per cent. Other benefits were that students email quotas were increased from 35MB to 7000MB, meaning students do not need to delete emails and all email became easily searchable. Furthermore, attachments of up to 20MB can be sent on each email, making collaboration much richer.<sup>103</sup>

- 4.95 The Committee was also told about the potential for 'e-portfolios' to streamline record-keeping and provide a detailed and media-rich archive of each student's achievements:

Students will develop e-portfolios from the point of initial enrolment, improving and transferring them throughout their career. Staff will develop e-portfolios to meet AQTF guidelines and record career highlights. For example a video receiving an award or a recording of them demonstrating a task. This will enable educational institutions (with the student's/staff member's permission) to contribute to the national archive. For example the early work of an artist will be archived for posterity.<sup>104</sup>

- 4.96 It is less clear whether there are significant cost savings to be obtained by institutions delivering educational courses online instead of (or as well as) in person. DBCDE told the Committee about a study in the United States which found that colleges implementing online learning programs saved 20 to 71 per cent of their cost of serving students, while at the same time improving educational outcomes.<sup>105</sup> However, Mr Lange from ACPET told the Committee that 'online training is not a cheaper option for delivery' because to be done properly it requires one-on-one support mechanisms.<sup>106</sup> Similarly, Mr Hamilton from OUA told the Committee that the cost savings from online education should not be overstated:

People say that doing it online is cheaper. Yes, in relation to not having to have the physical infrastructure. But the basic labour costs are still there ... You still need to have real people there, but not necessarily in the same ratios. We have done quite a lot of work on establishing what the best numbers of staff per students are so that we can find the most cost-effective way of delivering these courses.<sup>107</sup>

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103 NICTA, *Submission 198*, p. 15.

104 TAFE NSW – North Coast Institute, *Submission 59*, p. [2].

105 DBCDE, *Submission 215*, p. 44.

106 *Committee Hansard*, Canberra, 4 March 2011, pp. 38–39.

107 *Committee Hansard*, Melbourne, 18 March 2011, p. 7.

- 4.97 Copyright Agency Limited, which manages the statutory licence in the Copyright Act for educational use of text and images, warned against the misconception that digital content is cheaper and easier to produce than content in other formats, and argued that greater appreciation of the value of quality Australian digital content is required.<sup>108</sup>
- 4.98 Mr Tom Worthington, an independent IT consultant and computer scientist based in Canberra, stated in his submission to the Committee that governments are paying for ‘unnecessary duplication’ across education sectors in both online learning and physical infrastructure. Mr Worthington wrote that substantial savings could be obtained through the creation of an ‘Australian Learning Commons’ consisting of multi-use school buildings and free sharing of teaching materials throughout Australia:
- Despite work on a national curriculum ... individual teachers have to find materials to teach. Sharing of materials can be facilitated by the use of Creative Commons licensing, which allows any teacher to use the materials produced by any Australian educator, without the need for separate permission or payment of fees.<sup>109</sup>
- 4.99 Mr Worthington noted that the long term restructuring of the education systems towards a more efficient and effective ‘blended’ mode of education will require ‘retraining of teachers, restructuring of courses and the remodelling of buildings’ at a cost ‘far higher than for the implementation of the NBN itself’.<sup>110</sup> However, he also noted that due to the relative size of Australia’s expenditure on education, if the NBN can enable a 10 per cent reduction in the cost of education it would be enough to pay for the entire network within eight years.<sup>111</sup>

## Committee conclusions

- 4.100 The NBN will provide the speed and ubiquity of broadband connections that are required to revolutionise the way education takes place in Australia, leading to both more efficient delivery of services and more effective outcomes.
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108 Copyright Agency Limited, *Submission 92*, p. 3.

109 Mr Tom Worthington, *Submission 17*, p. 6.

110 Mr Tom Worthington, *Submission 17*, p. 5.

111 Mr Tom Worthington, *Submission 17*, p. 1.



- 4.101 As detailed in this chapter, the NBN will enable a host of new educational tools and services to be developed and delivered not only to traditional classrooms, but also to students in their homes, their workplaces and to the broader community. In particular, it will enable rich and interactive education and training to be delivered to people who have historically been isolated from educational opportunities, such as those who are ill, disabled, elderly, located in a remote area or who simply cannot attend classes because they have to work. It will enable a more flexible and efficient education system to be developed, in which students and teachers are no longer necessarily required to travel to the classroom and can access training and professional development material from their own homes and workplaces.
- 4.102 The Committee notes that many innovative educational tools and services are already being developed around Australia to take advantage of broadband, and the NBN will enable these applications to become more advanced and more accessible to students and teachers in all parts of Australia. The ongoing development of these products could provide significant export opportunities for Australia as other countries upgrade their broadband networks into the future.
- 4.103 Although the majority of schools and TAFEs around Australia are already connected to fibre, for the most part it is not currently being used to its potential. Most schools are still connecting their students and teachers with collective download speeds of less than 20 Mbit/s, and often much lower than that.
- 4.104 According to evidence received by the Committee, the main barriers to bandwidth usage are restrictive pricing structures and contractual arrangements in which schools, particularly in rural areas, are required to pay high rates for the volume of data that they use. While the Government's commitment to uniform national wholesale pricing for the NBN is likely to remove the disadvantage that rural schools face in this area, the nature of educational institutions is that they need to provide connectivity to many users simultaneously. Educational institutions therefore need access to high bandwidth connections within a pricing structure that allows for large volumes of data. Close attention will be required from the Federal Government and NBN Co during the NBN's design and implementation to ensure educational institutions are able to access high capacity and highly scalable connections that meet their enterprise needs at affordable, predictable prices.
- 4.105 The Committee also notes that as educational institutions need to share their connections between many simultaneous users, the limitations of

wireless and satellite services mean that schools in small communities outside the NBN's fibre footprint will not be able to benefit from all of the educational services discussed in this chapter. Remote schools in some parts of Australia have already been connected to fibre under state and territory government programs. The long term goal of governments at all levels should be to ensure that all schools and other educational institutions in Australia are connected to the type of scalable, high-capacity broadband services that will enable transformative educational outcomes to be delivered. The NBN's fibre extension program may have a role to play in achieving this goal. This issue will be discussed further in Chapter 11, where some of the overriding themes of the inquiry are explored.

- 4.106 The Committee received evidence that significant investment in training teachers in online educational skills and designing new educational models will be required to leverage the full benefits of the NBN. The Committee welcomes the Federal Government's recently announced 'NBN-enabled Education and Skills Services' program, which will fund projects that demonstrate the potential of the NBN for education in first release sites, and the 'NBN-enabled tele-education project' to deliver high-tech interactive training facilities in Armidale, NSW. These projects are indicative of the leadership role the Federal Government can play in promoting the utilisation of broadband technologies in education. The Committee notes that ongoing investment in such programs will be required across the country as the NBN rollout continues.

## Infrastructure and the environment

- 5.1 The Committee heard a range of evidence about the opportunities for Australia to increase its use of innovative ICT applications to better manage its built and natural resources and to improve environmental sustainability.
- 5.2 The Committee was told that an expanded digital economy, supported and enhanced by the NBN, can provide a means to ‘dematerialise’ the traditional economy. That is, it can replace ‘physical goods and activities with network based alternatives’,<sup>1</sup> allowing the economy to grow with less need to consume physical resources or to damage the environment.<sup>2</sup> SAIC Pty Ltd described a critical development from broadband expansion as:
- ... the ability to better manage our consumption of critical natural resources. Population growth, changing environmental conditions, and technology expansion itself continue to stress the regional and global supplies of oil, gas and water to limits that threaten sustainability. Ultimately, our ability to counter the stress we are putting on our natural resources will rely on our abilities to reduce demand for power and energy, better predict storms and floods, and more effectively provide food and water to our populations.<sup>3</sup>
- 5.3 There are a range of broadband-enabled technologies that can be employed to achieve more efficient use of resources. For example, ‘smart infrastructure’, which involves combining ICT technologies with infrastructure such as electricity grids, road networks and water systems, enables that infrastructure to be used more efficiently and sustainably.<sup>4</sup>

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1 Mr Tom Worthington, *Submission 17*, p. 4.

2 Dr Dean Economou, Technology Strategist, National ICT Australia (NICTA), *Committee Hansard*, Sydney, 29 April 2011, p. 60.

3 SAIC Pty Ltd, *Submission 35*, pp. 4-5.

4 Department of Infrastructure and Transport (DIT), *Submission 213*, p. [2].

Infrastructure Australia has identified a national broadband network as one of Australia's key infrastructure priorities, largely because of its ability to enable smart infrastructure technologies that make better use of Australia's existing infrastructure.<sup>5</sup> A ubiquitous NBN will serve as an enabler for this type of convergence between the physical and digital world, providing the network that is required to transport the extremely large amount of data generated by these activities.<sup>6</sup>

- 5.4 Access Economics has estimated that employing intelligent technologies into five key infrastructure areas could increase Australia's labour productivity by 0.5 per cent, create more than 70 000 jobs and increase GDP by between \$35 and \$80 billion over the first 10 years of implementation.<sup>7</sup>
- 5.5 This chapter will initially discuss some of the ways the NBN can lead to energy savings and reduced carbon emissions by promoting activities such as tele-working and green data centres. It will then explore how the NBN will enable better management of resources through the use of intelligent sensor networks. Finally, it will discuss how the NBN can increase the accessibility of spatial data, satellite and mapping services.

## **Reducing energy use and carbon emissions**

- 5.6 The Australian Information Industry Association (AIIA) told the Committee that ICT initiatives, supported by a world class national broadband network, have the potential to cut Australia's carbon emissions by 21 per cent.<sup>8</sup>
- 5.7 The Federal Government has identified as one of the key goals of its *National Digital Economy Strategy* that 'by 2020, the majority of Australian households, businesses and other organisations will have access to smart technology to better manage their energy use'.<sup>9</sup>

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5 Infrastructure Australia, *Getting the Fundamentals Right for Australia's Infrastructure Priorities*, June 2010, p. 40.

6 NICTA, *Submission 198*, p. 19; Professor Doan Hoang, *Submission 177*, p. 3.

7 Access Economics, *The Economic Benefits of Intelligent Technologies*, May 2009, p. ii.

8 AIIA, *Submission 184*, p. 14

9 Department of Broadband, Communications and the Digital Economy (DBCDE), *National Digital Economy Strategy*, May 2011, p. 29.

## Direct energy savings through more efficient networks

- 5.8 Several submitters and witnesses told the Committee that the NBN's FTTP network offers significant environmental advantages over alternative network technologies.
- 5.9 Huawei told the Committee about its own research that suggests moving from traditional phone networks to next-generation fibre-based networks could reduce network energy consumption by about 40 per cent.<sup>10</sup>
- 5.10 The Institute for a Broadband Enabled Society (IBES)'s supplementary submission provided a representation of the relative power consumption of seven different fixed line and wireless broadband technologies. It showed that the fibre-based technologies that will make up the majority of the NBN – PON and PtP – are by far the lowest consumers of power at fast broadband speeds.<sup>11</sup> Professor Rod Tucker, Director of IBES, explained to the Committee FTTN and HFC networks use more energy than FTTP because of the amount of equipment that needs to be deployed onto streets and power poles, and that wireless technologies (UMTS and WiMAX) are the highest consumers of energy due to the number of towers required to provide fast broadband speeds to each user.<sup>12</sup>
- 5.11 The Committee acknowledges the views of some contributors that the NBN also has the potential to harm the environment and therefore supports constructive advice to mitigate any negative impacts. Mr Tom Worthington submitted that the technology being deployed in the NBN is relatively energy efficient; however, as the NBN will be overall a very large user of electricity, the network should be designed in such a way to minimise energy consumption:
- ... for a given technology, as the data rate increases, so does the power consumption. Most of the time, most of the NBN will be carrying little or no data. The equipment used should therefore be designed to switch to a low power mode to conserve energy when possible.<sup>13</sup>
- 5.12 Mr Worthington also told the Committee that 'in the absence of sufficient planning and investment, there is a risk the NBN will harm the environment through the creation of electronic waste', in particular the back-up batteries provided with NBN Co's household units and

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10 Huawei, *Submission 105*, p. 9.

11 IBES, *Supplementary Submission 84.1*, p. [1].

12 *Committee Hansard*, Melbourne, 18 March 2011, p. 36.

13 Tom Worthington, *Submission 17*, p. 4.

equipment such as ADSL modems that will be made obsolete under a FTTP network.<sup>14</sup> Citing similar concerns, the Communications Alliance indicated to the Committee that it ‘strongly supports’ an ‘opt-in’ policy for NBN back-up batteries to help minimise the potential for improper disposal of such waste.<sup>15</sup>

## Supporting green data centres and consolidated ICT provision

5.13 The Committee heard that the NBN will enable large organisations to consolidate their databases and application servers into centralised locations, potentially leading to significant savings in energy and equipment. For example, the South Australian Government submitted:

Improved bandwidth into schools and government locations will support centralised provisioning of applications and storage of data. This will result in a significant reduction in ICT equipment and lead to associated reduction in the use of power for the equipment and necessary cooling.<sup>16</sup>

5.14 Monash University told the Committee of its existing plans to consolidate its ICT provision:

Data centres themselves are sizeable contributors to the carbon footprint of a university. To reduce this, Monash University is consolidating much of its ICT to a specialised off campus green data centre and utilising its high speed network to link the data centre to its campuses and some affiliated teaching hospitals.<sup>17</sup>

5.15 Monash has already been able to decommission 24 physical servers and three separate data centres through this policy, and expects to migrate another 770 servers to a ‘virtual server farm’ at its green data centre in 2011.<sup>18</sup> The University told the Committee that it is currently unable to consolidate its servers at locations that do not have high speed data links, such as its facility at Mildura Hospital, and these locations continue to require individual data centres ‘with their own servers, storage, associated cooling, backup power equipment and travel for support personnel’.<sup>19</sup> This limitation is even more acute outside university premises:

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14 Tom Worthington, *Submission 17*, p. 4.

15 Communications Alliance, *Submission 185*, p. 16.

16 SA Government, *Submission 195*, p. 8.

17 Monash University, *Submission 205*, p. 15.

18 Monash University, *Submission 205*, p. 16.

19 Monash University, *Submission 205*, p. 15.

This lack of connectivity is particularly acute within industry, businesses and the broader community. Schools in particular require their own data centres again with associated backup cooling and backup power equipment contributing to the overall carbon footprint of the educational sector. Readily available, affordable broadband connectivity could allow schools to pool resources utilising server virtualisation technology. Regional hubs could also act as backups for other hubs, increasing the resilience of the network and reducing the need for additional backup equipment at each site.<sup>20</sup>

- 5.16 The NBN will enable this type of consolidation to increasingly occur in other sectors, particularly as applications are increasingly delivered through cloud services, as discussed in Chapter 2 on government services and Chapter 6 on economic development. The environmental benefits of data centre consolidation are maximised if data centres are located close to sites of energy generation, particularly renewable energy, and the extensive fibre network provided by the NBN will help make this possible in more locations. Mr Tony Brun, Chief Executive Officer of the City of Greater Geraldton, told the Committee that his Council is looking at opportunities for green data centres to be set up in the small community of Mullewa, which has recently been connected to fibre backhaul.<sup>21</sup>

## Reducing the costs of travel

- 5.17 One of the goals identified in the Federal Government's *National Digital Economy Strategy* is that by 2020, 'at least 12 per cent of Australian employees report having a tele-working arrangement with their employer'.<sup>22</sup>
- 5.18 As discussed in Chapter 2, tele-working may provide benefits across a range of areas, including for the environment. The reductions in fuel use that are possible through tele-working could have a significant impact on reducing carbon emissions. Citing a recent Access Economics report,<sup>23</sup> DBCDE told the Committee:

It is estimated that a 10 per cent increase in Australian employees that tele-work 50 per cent of the time would save an estimated 120 million litres of fuel, avoiding 320,000 tonnes of CO<sub>2</sub> ... and would

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20 Monash University, *Submission 205*, pp. 15–16.

21 *Committee Hansard*, Perth, 6 May 2011, pp. 3–4.

22 DBCDE, *National Digital Economy Strategy*, May 2011, p. 40.

23 Access Economic, *Impacts of Teleworking under the NBN*, August 2010.

reduce traffic at peak periods by 5 per cent, resulting in a reduction of \$470 million in congestion costs. These outcomes would have a flow-on benefit of reducing strain on infrastructure.<sup>24</sup>

- 5.19 A number of other submitters and witnesses told the Committee about the positive environmental and economic impacts of tele-working. For example, Regional Development Australia (RDA) Illawarra told the Committee:

The ability to tele-commute and work remotely will decrease the need to travel for work purposes, and will therefore decrease the impact on our natural resources. This is particularly relevant to the Illawarra which has the largest commuting population in the country. Some 20,000 people commute to Sydney daily, having a huge impact on transport systems and roads, and contributing to carbon emissions.<sup>25</sup>

- 5.20 By enabling the increased use of video-conferencing and 'tele-presence' to facilitate meetings, the NBN will also encourage a reduction in the amount of business travel. DBCDE told the Committee collaboration online through the use of high quality, high-definition video-conferencing can reduce the need to travel for meetings:

The Australian Government and State and Territory governments, for example, have used high-definition tele-presence technology for numerous COAG meetings. The National Tele-presence System has been operational since July 2010. Benefits from the use of the system for the period from October 2010 to January 2011 include estimated savings of \$3 million and reduced greenhouse gas emissions attributed to the Australian Government of an estimated 490 tonnes.<sup>26</sup>

- 5.21 Infrastructure Australia cited the example of CISCO, a company which by using video-conferencing, avoided 53 788 meetings that would have involved travel: 'They estimated this at a \$81 million annual productivity cost saving not to mention the 116,000 metric tons of emissions.'<sup>27</sup>

- 5.22 The Committee considers that the benefits of tele-commuting and tele-presence apply equally in the higher education sector. While the broader benefits of the NBN to the education sector are discussed in detail in
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24 DBCDE, *Submission 215*, p. 55.

25 RDA Illawarra, *Submission 90*, pp. 2-3.

26 DBCDE, *Submission 215*, p. 56.

27 Infrastructure Australia, *Submission 10*, p. 3



Chapter 4, it is worthwhile considering some associated impacts from an infrastructure and environment perspective. The Committee notes evidence from Monash University that the ‘classroom of the future can be delivered to students on and off campus’ which ‘will minimise the need to attend campus’, a development not supported by the current copper networks.<sup>28</sup>

... Monash University is already taking steps in this direction by utilising its high-speed network connectivity with other universities to share data and electronic versions of research materials and journals. Initiatives such as electronic delivery of lectures to students in teaching hospitals or conferences, contribute toward reducing the need for lecturer and student travel.<sup>29</sup>

- 5.23 By reducing the frequency with which academic staff need to attend conferences, including those held overseas, in order to share knowledge and interact with their colleagues, Monash noted that: ‘video-conferencing, virtual reality and collaborative tools can markedly reduce travel requirements. The cost savings to universities and the reduction in carbon footprint can be significant.’<sup>30</sup>
- 5.24 The Committee notes with interest the additional benefits which are associated with reduced travelling, including social and community benefits as will be discussed in detail in Chapter 8. Not only would the type of technologies and applications described above decrease the need for travel between cities to attend meetings, training programs and seminars, but they could also ‘allow businesses to locate outside of the traditional central business districts, potentially reducing the overall need to travel for employees, customers and goods.’<sup>31</sup>
- 5.25 Increasing growth in regional centres could also ease congestion and other infrastructure pressures in cities. The Committee understands that the NBN will help make regional centres more economically and environmentally sustainable. RDA Northern Rivers described the ‘natural amenity’ of its region as a ‘key attribute which accounts for the rate of in-migration’:

The management and maintenance of our natural amenity and environmental sustainability are a priority and the encouragement

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28 Monash University, *Submission 205*, p. 15.

29 Monash University, *Submission 205*, p. 15.

30 Monash University, *Submission 205*, p. 15.

31 DIT, *Submission 213*, p. [6].

of home-based businesses which rely on high speed broadband as opposed to travelling long distances by motor vehicle to an office base ... might ensure the sustainability of our environmental credentials.<sup>32</sup>

- 5.26 The Committee heard from inquiry participants that the NBN would enable efficient new technologies, such as remote mining operations and transport monitoring systems, to be deployed in the mining and resources sector.<sup>33</sup> The NBN could also increase the ability of mining companies to attract and retain employees, for example, by enabling video links that offset the impacts of isolation in rural and remote areas.<sup>34</sup> Employees and their families would have more opportunities to access training, education, healthcare and social services on-site, which would help encourage them to live in remote towns rather than relying on fly-in/fly-out arrangements.<sup>35</sup>
- 5.27 The broader economic benefits of the NBN for regional Australia are discussed in Chapter 6.

## Smart grids to reduce energy waste

- 5.28 Another way in which the NBN will enable a reduction in energy use is through 'smart grids'; that is, the embedding of technology, particularly 'smart meters', into the electricity grid to better manage energy supply and demand. A useful description of the operation of smart meters and smart grids was provided by the Department of Resources, Energy and Tourism (RET):

Smart meters are electricity meters that are capable both of measuring and recording energy consumption in short intervals, and of two-way communication, enabling energy providers to read and control features of the meter remotely. Smart meters are a key component of smart grids, which combine advanced telecommunications and information technology applications with 'smart' appliances in the home to enhance the energy efficiency of the electricity power grid, while helping householders save on their energy bills.<sup>36</sup>

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32 RDA Northern Rivers NSW, *Submission 55*, p. 11.

33 Thales, *Submission 109*, p. A-4; CSIRO, *Submission 171*, pp. 14-15; SA Government, *Submission 195*, p. 8.

34 SA Government, *Submission 195*, p. 8.

35 RET, *Submission 190*, p. [5].

36 RET, *Submission 190*, pp. [3-4].

- 5.29 A key aspect of smart grids is that energy consumers are made more aware of their energy usage, enabling them to make more informed choices. According to Infrastructure Australia:

... smart energy grids help to enhance the efficiency with which consumers use energy by enabling sophisticated choices such as time of day consumption, pre-specified tolerance to interruptions, the defined management of appliances, and consumers' sensitivity to price fluctuations.<sup>37</sup>

- 5.30 The Committee was advised that smart grids are becoming more essential as the use of renewable energy sources increases. The Whitsunday Hinterland and Mackay Bowen Regional Organisation of Councils (WHaMBROC) submitted:

Alternative energy sources such as solar, wind, hydrogen fuel cells, clean batteries and so on will become the distributed sources of energy in the future and will introduce greater complexity to energy generation, distribution and consumption. This brings new opportunity to manage demand and generation to minimise carbon outputs, but requires this new and complex network of energy elements to be interconnected and controlled; a very different situation from the largely passive energy networks today. The NBN will offer an opportunity to connect many thousands of points of demand and generation inexpensively, and bring control to the new form of energy network that will form in the coming decades.<sup>38</sup>

- 5.31 Describing the benefits of smart grids for managing fluctuating energy supplies, Mr Matthew Sundberg, Market Analyst for the 'Picture the Future' project at Siemens Ltd, told the Committee that smart infrastructure is needed:

... when you have wind and solar generation happening whenever – and they are a lot harder to predict – you need to manage the consumption side. That is where the smart grid comes into play. You will have smart meters to give you a good understanding of what is being consumed where, what is connected to the grid, whose solar PV is seeing sunshine and whose micro wind turbine is seeing wind. There is all this data

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37 Infrastructure Australia, *Submission 10*, p. 3.

38 WHaMBROC, *Submission 62*, p. [4].

that needs to be processed and brought into one big stability control for the grid.<sup>39</sup>

5.32 The Committee was told by NICTA that the NBN will provide the stable, reliable network that is required to underpin smart grid technology.<sup>40</sup> DBCDE told the Committee that while individual smart meters do not require high bandwidth in themselves, as uptake increases the cumulative data that is generated will require ‘ubiquitous, reliable, high-speed broadband’.<sup>41</sup>

5.33 Professor Tucker of IBES told the Committee that ubiquity and reliability are more important than bandwidth for supporting smart grids.<sup>42</sup> Similarly, in their joint submission RDA Hunter and RDA Central Coast told the Committee that the ubiquity of the network is essential:

Devices that connect to the network ... will need to communicate via a common communications protocol. The NBN will be a key enabler of a concept known as device convergence. Because all devices will communicate via the IP protocol they will be able to communicate with one another as well.

This will lead to innovations in utility management and will improve fault rectification, increase efficiency, reduce costs and potentially forestall the requirement for additional utility capacity.<sup>43</sup>

5.34 CSIRO told the Committee that as the sophistication of smart grids increases, the capacity of the networks underpinning them will become increasingly important:

CSIRO is investigating systems that can switch high energy-use appliances in homes and small businesses on and off depending on the load on the network, price of electricity and preferences of the customer. Such a change requires a whole-of-network approach, including integration with thousands of components in the grid that need to be monitored and controlled. Smart grids will become increasingly complex with high data flows. While the data required per site is small, when aggregated these data flows are significant and will require broadband infrastructure.<sup>44</sup>

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39 *Committee Hansard*, Melbourne, 18 March 2011, p. 61.

40 NICTA, *Submission 198*, p. 20.

41 DBCDE, *Submission 215*, p. 53.

42 IBES *Committee Hansard*, Melbourne, 18 March 2011, p. 37.

43 RDA Hunter and RDA Central Coast, *Submission 57*, p. 10.

44 CSIRO, *Submission 171*, pp. 12–13.

5.35 The RET submission further explained the relationship between smart grids and the NBN:

The broader adoption of smart grids is contingent on the existence of appropriate communications technologies that enable two-way flow of data across the entire energy delivery chain ... there are a range of potential opportunities that may be leveraged between NBN Co's FTTP deployment and the adoption of smart metering and smart grids. These opportunities consider a collaborative approach to the deployment of NBN and smart meter / smart grid services and, if realised, may deliver a more efficient commercial and operational model than would be achieved individually ...

Electricity utilities may also find benefit in utilising the NBN for their communications requirements due to the following factors:

- its wide-scale geographic coverage with defined communications service capability,
- the ability to leverage pre-existing operational support processes and models,
- reliable service delivery, and
- the need not to increase the utilities communications workforce to deal with operations and maintenance issues ...<sup>45</sup>

**Box 5.1 Smart Grid, Smart City**

The \$100 million National Energy Efficiency Initiative—Smart Grid, Smart City—will demonstrate Australia's first commercial-scale smart grid, ways to improve the reliability of electricity services for consumers and, in conjunction with smart meters, help consumers understand and manage their electricity consumption.

One of the principle objectives of Smart Grid, Smart City is to investigate synergies with other infrastructure (such as gas and water) and the NBN. This includes considering how smart meters can be integrated with NBN equipment (including home devices), and considering how NBN Co should interact with energy suppliers.

Source: RET, *Submission 190*, p. [9].

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45 RET, *Submission 190*, pp. [3–4].

## Managing infrastructure using sensor networks

- 5.36 While smart grids can be used to more efficiently manage energy networks, there are other types of smart technologies that can be used to monitor and manage physical infrastructure, particularly using networks of sensors. This section will examine how these sensors, which include high definition video cameras, can be used to more effectively manage transport, other public infrastructure, natural resources, agricultural assets and the environment.

## Intelligent Transport Systems (ITS)—reducing traffic congestion

- 5.37 Traffic congestion is a significant problem for Australian cities, with large social, environmental and economic costs. DBCDE told the Committee:

The Bureau of Infrastructure, Transport and Regional Economics (BITRE) ... estimated that in 2005 the social costs of congestion across Australia's capital cities equalled about \$9.4 billion. This figure is based on costs associated with people's loss of private time, loss of business time, extra vehicle operation and extra air pollution. The BITRE estimates these costs will double during the 15 years between 2005 and 2020 to \$20.4 billion.<sup>46</sup>

- 5.38 Intelligent Transport Systems (ITS) involve deploying smart technologies into transport infrastructure in order to relieve congestion and improve safety. ITS includes a range of wireless and fixed line information and electronic technologies. Infrastructure Australia explained that such technologies relieve congestion, improve safety and enhance productivity when integrated into transport networks.<sup>47</sup>

- 5.39 ITS 'adaptively control traffic signalling and speed limits to help manage congestion, reduce the number of starts and stops, reduce travel times and reduce greenhouse gas emissions'.<sup>48</sup> NICTA noted that:

Using networks of sensors across the transport network and, increasingly, sensors inside vehicles allows intelligent transport systems to control traffic signals, speed limits, ramp metering, variable tolls and other methods to manage road congestion, reduce delay and reduce the number of starts and stops ...

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46 DBCDE, *Submission 215*, p. 52.

47 Infrastructure Australia, *Submission 10*, pp. 2–3.

48 NICTA, *Submission 198*, p. 20.

- 5.40 Infrastructure Australia informed the Committee of three current applications of ITS:
- IntelliDrive applications utilise information technology to enable connectivity between vehicles to maximise safety, and between vehicles and network infrastructure to maximise flow.
  - General Motors' OnStar technology (an in-vehicle ITS) enables automatic crash response by reporting the condition of vehicles and occupants to emergency agencies via Global Positioning System (GPS).
  - Integrated Corridor Management (ICM) technology allows management of transport networks as whole systems, not individual assets. For example, a driver in an ICM corridor can be informed of congestion and given alternative travel options, improving overall network efficiency.<sup>49</sup>
- 5.41 The Committee notes the current collaboration between Infrastructure Australia and the States and Territories on a proposal for managed motorways. This involves managing demand, congestion and safety on Australia's major motorways.<sup>50</sup>
- 5.42 While the Committee accepts that ITS is not a new concept, and is already operating to varying degrees across Australian cities and around the world, it acknowledges NICTA's view of Australia's pioneering role in developing ITS. NICTA told the Committee that Australia has led the world developing ITS systems such as the Sydney Coordinated Adaptive Traffic System (SCATS) in the 1970s, now used across Australia and in over 100 cities globally:
- Through the use of algorithms for coordinating traffic lights, this system is typically capable of reducing travel times by 20%, and reducing the number of stops by up to 40%. These savings are directly reflected in reduced greenhouse gas emissions in Australia and across the globe.<sup>51</sup>
- 5.43 During the course of the inquiry, NICTA demonstrated to the Committee how networks of high-definition cameras can be used for traffic monitoring. NICTA's submission explained that the NBN would enable SCATS and other traffic management systems be improved and deployed more widely:

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49 Infrastructure Australia, *Submission 10*, p. 3.

50 Infrastructure Australia, *Submission 10*, p. 3.

51 NICTA, *Submission 198*, p. 20.

NICTA is working with the NSW RTA to optimise the algorithms used in SCATS as well as developing traffic lights which can ‘see’ cars and other vehicles approaching intersections to provide for more efficient traffic control and to further reduce road congestion. NICTA also has deployed technologies for better routing of delivery and service vehicles. These technologies, leveraging off the NBN, will provide a more efficient transport and logistics industry and overall a reduced carbon footprint.<sup>52</sup>

5.44 DIT told the Committee about the increasing telecommunications capacity of ITS applications, particularly in relation to next-generation applications in which data is transmitted between moving vehicles and roadside infrastructure. Examples of applications include:

- Traffic Management Systems: manage the transport system with knowledge of the real-time location of every vehicle, including pre-emption at traffic signals for priority vehicles;
- Incident Response: improved response to incidents and improved traffic flow restoration times; and
- Access to Information En-route: vehicle access to real-time safety and congestion advice and information such as weather en-route.<sup>53</sup>

5.45 DIT explained that the NBN would be essential to enable these types of applications to be delivered:

Future ITS opportunities will depend on short range roadside and vehicle-to-vehicle communication, via satellite and wireless technology, being linked back to road network control by optic fibre. For that reason the NBN will be integral to future ITS delivery and the Department is actively engaged in further developing its understanding of how the NBN can contribute and add value to ITS technologies and their application.<sup>54</sup>

## Smart infrastructure to manage assets and water resources

5.46 Infrastructure Australia told the Committee that smart infrastructure can also be used for monitoring the safety and managing the maintenance of a range of physical assets:

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52 NICTA, *Submission 198*, p. 20.

53 DIT, *Submission 213*, p. [5].

54 DIT, *Submission 213*, p. [5].



For example, the newly reconstructed I-95 Minnesota bridge in the United States includes \$1 million of sensors that enable it to continually monitor the condition of girders, ice on the road surface, and general traffic – an obvious safety benefit to motorists that can also help manage maintenance expenditure more efficiently.<sup>55</sup>

- 5.47 Similarly, Townsville City Council submitted that remote sensors supported by broadband would improve the decisions made by resource managers:

An ability to monitor the health and well-being of our built and natural environments is fundamental to the development of sound management systems ... Increased broadband capacity across a network will allow for resource managers to better manage their resources.

One area where the NBN will provide significant benefits for resource managers is remote sensing. Having a network capable of relaying large volumes of information from a wide range of sites and having applications able to process this information will allow for more effective and efficient management of resources.<sup>56</sup>

- 5.48 Other submitters told the Committee that the NBN could enable more widespread use of smart building management systems, which could reduce energy consumption by an estimated 30 per cent.<sup>57</sup> For example, SAIC told the Committee it has developed energy-saving building management systems that are designed to interact with sensors in large manufacturing facilities.<sup>58</sup>

- 5.49 Building Information Modelling (BIM) is the process of generating and managing building data during its life cycle by the use of three-dimensional, real-time, dynamic building modelling software, potentially leading to significant productivity gains in the construction sector.<sup>59</sup> DIISR told the Committee that while BIM software was not dependent on the NBN itself, the NBN would make electronic building models more accessible to the public and to planning authorities. The information would become available throughout the life of the building, enabling

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55 Infrastructure Australia, *Submission 10*, p. 3.

56 Townsville City Council, *Submission 199*, p. 4.

57 NICTA, *Submission 198*, p. 20.

58 SAIC, *Submission 35*, pp. 4–5.

59 Mr Mike Lawson, Head of Manufacturing Division, DIISR, *Submission 219*, pp. 15–16.

aspects of the building such as the shadow it casts and its visual amenity to be used by planners into the future.<sup>60</sup>

5.50 The ACT Government told the Committee about its plans for BIM:

The concept of a 'Virtual ACT' is being investigated to utilise web 2.0 to facilitate improved planning and public consultation utilising, amongst other technology, 3D modelling. This will enable urban infill building applications to be modelled and viewed against environmental and aesthetic considerations such as shadowing, solar access and visual impact. Broadband capacity currently limits the flexibility and usability of current systems however the NBN would enable greater interactive analysis and more real-life modelling.<sup>61</sup>

5.51 The Committee heard about the potential improvements which would be made possible by the NBN in the management of water resources, including during floods and natural disasters. In terms of the better management of water resources, the Committee was advised that:

Water is a precious resource, and broadband enabled smart systems can make an important contribution to protecting this resource and ensuring that it is used wisely. Intelligent systems can be used to monitor water flows and provide 'on demand water supply'. The savings from providing water as required and reducing water wastage can be substantial.<sup>62</sup>

5.52 Mr Bob Carmichael, Manager of Business and Economic Development at the City of Tea Tree Gully in South Australia, told the Committee that the City intends to use the NBN to improve its existing stormwater and wastewater systems by implementing remote digital operating and monitoring systems. Mr Carmichael observed that the difficulties the city experiences with monitoring its stormwater and wastewater facilities, caused by inconsistent internet services, are expected to be overcome with the NBN's implementation. He also explained that the NBN will be the basis for managing the future sustainability of the 592 parks and reserves administered by the city, for example, by 'allowing the use of remote digital systems to control and monitor efficient water use'.<sup>63</sup> Mr Carmichael noted that:

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60 *Committee Hansard*, Canberra, 6 July 2011, p. 2-3.

61 ACT Government, *Submission 227*, p. 9.

62 ACT Government, *Submission 227*, p. 9.

63 *Committee Hansard*, Adelaide, 4 April 2011, pp. 27-28.

Our re-use of water is continuing to grow. To send it off to our various ovals and reserves and to perhaps sell it to neighbouring councils, we need to have a reliable system. That is what we are looking for.<sup>64</sup>

- 5.53 Ipswich City Council submitted that the recent floods affecting its region highlighted the need for advanced river monitoring technology that would improve the monitoring and management of flood events.<sup>65</sup> CSIRO told the Committee about current activities in that region, including the deployment of sensors at Lake Wivenhoe Dam to monitor water column temperature and catchment health, a project which has allowed dam operators to control the quality of water supplied to the city of Brisbane. CSIRO noted that:

This type of sensing technology can be adapted to sense many other parameters such as water levels, temperature changes and video surveillance of traffic and other assets. With the addition of adequate network reach, remote control of valves, switches or other actuation devices will be possible.<sup>66</sup>

- 5.54 In considering monitoring of water during flood events, the Committee noted the impacts of flood waters on infrastructure. Glenys Schuntner, Chief Executive Officer of RDA Townsville and North West Queensland, told the Committee that real-time video monitoring supported by the NBN would greatly improve the ability of authorities to assess the condition of roads and infrastructure during flood events:

While we have talked about the remote management of energy systems, I would also apply that need to our management of rail and road infrastructure, so you do not have to send someone out hundreds of kilometres in a disaster to find out the status of a road or railway. By real-time monitoring, which is enabled through [the] NBN, you can actually have someone in Julia Creek or someone in Mount Isa seeing what the situation is. They do not have to get out in their car to physically see things as well.<sup>67</sup>

## Agricultural applications

- 5.55 Although the broader potential of the NBN to support agriculture is discussed in Chapter 6, the Committee heard that NBN-enabled sensor

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64 *Committee Hansard*, Adelaide, 4 April 2011, p. 32.

65 Ipswich City Council, *Submission 83*, p. 14.

66 CSIRO, *Submission 171*, p. 11.

67 *Committee Hansard*, Townsville, 19 April 2011, p. 43.

networks can be effectively deployed in a range of agricultural settings, leading to improved productivity.<sup>68</sup> The University of New England (UNE) provided a concise summary of how these types of sensors could be used:

The farmers can get sensors that tell them where their stock is, what parts of fields they preferentially graze, what the weight gain is. They can remotely monitor pasture for moisture content, for pasture growth and thus they can work out when and how to move stock around for maximal yield. But at present they cannot handle that data themselves, because they do not have access to enough bandwidth. NBN will enable on-farm analysis of data and real time application of results to the better management of the farm.<sup>69</sup>

5.56 At a public hearing, Mr Robert Walker, Chief Executive Officer of AgForce Queensland, told the Committee:

Remote monitoring of vegetation, remote monitoring of waterholes and remote monitoring of watercourses have all been regulated and prescribed by governments at all levels. Unfortunately, the technology is not there to deliver the information that governments require. Again, the delivery of an effective and efficient broadband technology to those areas would certainly facilitate that.<sup>70</sup>

5.57 Goondiwindi Regional Council similarly described the potential of high speed internet access for agribusiness, catchment management groups and environmental management organisations in accessing new forms of data collection and analysis, in turn improving the quality of local decision making:

As rural industries move to more scientific management systems for water, soil quality, cropping and animal production the need for real time data collection and analysis is becoming essential to ensure the environmental and economic sustainability of the region.<sup>71</sup>

5.58 CSIRO submitted that NBN infrastructure could ‘provide the backbone of a whole-of-farm sensor network’ which would enable ‘new methods for pest detection (and potentially control) and development of new

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68 NICTA, *Submission 198*, p. 21.

69 UNE, *Submission 191*, pp. 4–5.

70 *Committee Hansard*, Brisbane, 18 April 2011, p. 29.

71 Goondiwindi Regional Council, *Submission 69*, p. [2].

harvesting techniques using robots or automated or semi-automated farming equipment'.<sup>72</sup> CSIRO also told the Committee about a recent project working with dairy farmers in Tasmania to continuously monitor soil moisture in their fields, enabling irrigation to be optimised.<sup>73</sup>

- 5.59 Noting that 'protecting [the] Australian environment and farmlands from invasive pests and diseases is a major and very expensive goal', UNE outlined to the Committee the significant benefits the NBN could produce in the field of agricultural biosecurity. UNE noted that the likely sites of entry of pests and diseases are often remote, but expertise is limited and often centred in major cities. Delays are experienced in effectively identifying and treating crops before diseases spread:

What if the farmer could take a photo of the infected cereal on his mobile phone, beam it straight to the plant pathologist, who could give advice on how to deal with it within a few hours, thus enabling control, preventing widespread dispersal and preventing major crop loss with the associated economic loss. The NBN will enable this.<sup>74</sup>

- 5.60 CSIRO told the Committee that it has developed a tele-presence system to 'monitor and manage disease outbreaks with high resolution communication, laboratory analysis and geospatial information'.<sup>75</sup> This system will enable sharing of information between scientists during biosecurity emergencies in a way that was not previously possible. CSIRO advised that the system will eventually be deployed around the country, and while it will focus on exotic and emerging animal disease, similar systems are envisaged for human health applications. CSIRO notes that with a ubiquitous high speed network 'this type of technology could be made more widely available to the agribusiness industry, not only for biosecurity, but to share information about methods for improving productivity'.<sup>76</sup>

## Environmental monitoring applications

- 5.61 The Committee heard that the deployment of NBN-enabled sensor networks could considerably improve environmental monitoring services. For example, SAIC Pty Ltd told the Committee that its work in weather

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72 CSIRO, *Submission 171*, p. 12.

73 CSIRO, *Submission 171*, p. 11.

74 UNE, *Submission 191*, p. 5.

75 CSIRO, *Submission 171*, p. 12.

76 CSIRO, *Submission 171*, p. 12

prediction, climate research, seismic and ocean monitoring, including the tsunami warning buoys operated by the Bureau of Meteorology, could all benefit from the increased number of sensors and increased capacity for data collection in remote locations that will be enabled by the NBN.<sup>77</sup>

5.62 The Australian Institute of Marine Science (AIMS) submitted that its network of remote monitoring stations, such as the ones that provided information about Cyclone 'Yasi', would be enhanced by the NBN. AIMS also submitted that the improved availability of bandwidth will 'support work such as forecasting the impact of a warming ocean, box jellyfish monitoring and monitoring and forecasting coral bleaching'. AIMS's work in very remote locations, such as the outer Great Barrier Reef, would be particularly enhanced.<sup>78</sup>

5.63 Similarly, CSIRO told the Committee that NBN-enabled sensor networks could:

... operate as early warning systems to alert communities about algal blooms, pest outbreaks, natural disasters such as floods and bushfires; environmental accidents such as contamination of drinking water; or terrorism events such as poisoning of a major water supply.<sup>79</sup>

5.64 Professor Ian Atkinson, Director of James Cook University (JCU)'s eResearch Centre, told the Committee about the potential of video-based monitoring for environmental research:

An enormous amount of information can be extracted from video. At the moment we just look at pictures and maybe walk away, but we can assess vegetation states. We could probably determine levels of rainfall at particular points in time. Environmental health and quality can be measured ...<sup>80</sup>

5.65 Chapter 7 on research and innovation contains further information on the how NBN-enabled video monitoring could transform environmental research.

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77 SAIC, *Submission 35*, p. 5.

78 AIMS, *Submission 60*, p. [1].

79 CSIRO, *Submission 171*, p. 11.

80 *Committee Hansard*, Townsville, 19 April 2011, pp. 7-8.

## More accessible spatial data, satellite and aerial observation services

5.66 The Committee was told that spatial information is essential for resource management across a wide range of government and industry sectors. PSMA noted:

The management of Australia's natural resources and assets largely relies on location information to assist in their tracking and use. Industries readily using location information include mining, logistics, and agriculture.<sup>81</sup>

5.67 RET advised the Committee that:

The concept of mapping information to better understand business activities is being widely adopted to make improved decisions and increase the effectiveness of work activities. A current example is the efforts being put into maps to support the recovery processes of the Queensland floods and the northern Queensland cyclone, which, through the application of spatial information, have resulted in significant public safety outcomes.<sup>82</sup>

5.68 RET further explained that the NBN could have a significant role in increasing the capacity of organisations to access spatial information, which is currently limited due to the large amounts of data involved:

Spatial resources are quite frequently large in size and organisations must invest significantly in data management infrastructure to hold up to date spatial datasets. This large investment often weakens the business case for leveraging the location component of their information and, as a result, organisations may reduce their effectiveness and the quality of their decision making processes.<sup>83</sup>

5.69 1Spatial Asia Pacific also noted that the spatial information industry is synonymous with large file types and the need to process large files, and went so far as to describe the NBN as a 'game changer' for the spatial information industry. Their submission stated that a paradigm shift in thinking would be required 'to maximise the opportunities that [the NBN]

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81 PSMA Australia, *Submission 64*, p. [3].

82 RET, *Submission 190*, p. [7].

83 RET, *Submission 190*, p. [7].

will present us and possibly position Australian companies to take a leading role globally ...'<sup>84</sup>

5.70 1Spatial submitted that the NBN, by increasing the availability of bandwidth, will enable it to make its services available online as a cloud service, eliminating the need for its customers to invest in expensive technologies and expertise that currently have to be duplicated at every customer site in order to utilise spatial information. Industries located in rural areas will benefit the most, as they 'will have access to effectively online expertise and processing capabilities equivalent to anywhere in Australia'.<sup>85</sup>

5.71 The Committee was also told that the NBN would increase the accessibility of aerial mapping services. Mr David Farmer, General Manager of Wollongong City Council, told the Committee that the Council has a range of online Geographic Information Systems (GIS) and coastal hazard studies that are currently limited in their accessibility:

... some of our really big documents are extremely difficult to access with ADSL, for example, the coastal hazard study. We have 100 kilometres of coastline ...and 3000 properties are at risk of tidal inundation ... Obviously people are interested. When they get to the documents and the maps they are quite difficult to download.<sup>86</sup>

5.72 The Committee heard from NearMap Pty Ltd, a Perth-based company that specialises in high-resolution aerial photo mapping and terrain mapping technology (see Box 5.2 below for more details).

5.73 The uptake of NearMap-type products is dependent on the widespread availability of the type of fast broadband the NBN will provide:

We are a very high bandwidth, rich-content product and, even on our relatively fast ADSL 2+, it can still take quite a while to download the content. In terms of the impact of the NBN on our customers, in the community, in business and in government, our view is that access to bandwidth, the speed of that bandwidth and price are key.<sup>87</sup>

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84 1Spatial, *Submission 229*, p. [1].

85 1Spatial, *Submission 229*, p. [1].

86 *Committee Hansard*, 28 April 2011, p. 47.

87 Mr Adrian Young, Director of Sales, Nearmap Pty Ltd, *Committee Hansard*, Perth, 6 May 2011, p. 29.



**Box 5.2**      **NearMap**

NearMap publishes detailed and regularly-updated photo maps of large towns and cities around Australia which are made available online in time series archives. The imagery is free to the general public and most small businesses at [nearmap.com](http://nearmap.com). Revenue is generated through licensing to government and large corporations.

The spatial information provided by this photographic content has broad applications across many service sectors including environmental compliance and natural resource management, building regulations, customer service and strategic planning, and emergency management. Insurance companies, the mining industry, the tourism industry and a variety of government agencies are all increasingly reliant on this type of information.

As an example of the practical application of the technology, during the Queensland floods of January 2011, NearMap was requested by Brisbane and Ipswich City Councils to quickly capture photo maps of their area. The maps were used both for the immediate response and reconstruction effort, and to record the high water mark for future disaster planning.

Source: Mr Adrian Young, Director of Sales, Nearmap Pty Ltd, *Committee Hansard*, Perth, 6 May 2011, pp. 28-29.

- 5.74      The Committee heard that the NBN could also enhance emergency management by improving the reliability of communications infrastructure and information services.<sup>88</sup> Mr John Grant, Chair of the IT Industry Innovation Council, told the Committee that during the January 2011 floods in Brisbane, the websites that contained maps of the areas expected to be flooded ‘collapsed’ due to the large demand for information from the public. Mr Grant said that if these website servers had been hosted in ‘the cloud’, connected with robust NBN-style infrastructure, there would have been unlimited capacity for people to access the information they needed.<sup>89</sup>
- 5.75      The Committee was told by several inquiry participants that Earth Observation from Space (EOS) is crucial to a variety of government programs and contributes significantly to Australia’s economy. The Space Industry Innovation Council submitted:

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88 Mr Shenal Basnayake, Economic Development Officer, Cassowary Coast Regional Council, *Committee Hansard*, Townsville, p. 49.

89 *Committee Hansard*, Brisbane, 18 April 2011, p. 33.

Increasingly, earth observation satellites are creating an explosion in the quality and amount of imaging data available for analysis and interpretation. In fact, in Government alone, there are currently at least ninety two programs, totalling \$1.3 billion in annual expenditure, which are dependent on EOS. EOS contributed at least \$3.3 billion to Australian GDP in 2008-09 and on conservative assumptions it is estimated that the contribution to GDP could grow to around \$4 billion by 2015.<sup>90</sup>

- 5.76 Government services that are supported by satellite observations include programs for national security, weather forecasting, safety, and climate change monitoring.<sup>91</sup> With increasingly large datasets being generated, the Committee was told that Australia's ability to continue to benefit from EOS capabilities is being put at risk due to a lack of effective communication networks to satellite ground stations.<sup>92</sup> RET told the Committee:

Current telecommunications networks cannot cope with the load associated with satellite data and, as such, much of the information has to be transferred across the country and internationally via postal and courier services. This method of transportation is too slow for emergency situations.<sup>93</sup>

- 5.77 For example, the Department of Innovation, Industry, Science and Research (DIISR) told the Committee that the satellite data pertaining to the 2009 Black Saturday Bushfires was delayed by the inability to transfer files electronically.<sup>94</sup>

- 5.78 The Space Industry Innovation Council submitted that the NBN would provide the connectivity required to overcome these problems and for satellite datasets to be used more effectively:

The speeds available via the NBN to transport increasingly large satellite datasets for analysis into decision support information will lead to productivity gains and improved outcomes in fields such as weather forecasting, climate change, resources management, emergency response, and defence surveillance. It is important that NBN access be available to the major earth

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90 Space Industry Innovation Council, *Submission 73*, p. 4.

91 DIISR, *Submission 219*, p. 6.

92 RET, *Submission 190*, p. [7].

93 RET, *Submission 190*, p. [6].

94 DIISR, *Submission 219*, p. 6.

observation infrastructure used predominantly for public good services throughout Australia.<sup>95</sup>

- 5.79 Chapter 7 on research and innovation contains further information on how the NBN's satellite capacity could be used to expedite developments in the area of environmental monitoring.

## Committee Conclusions

- 5.80 The NBN will be the enabler of technological innovations that could improve the way the environment and infrastructure are managed in Australia.
- 5.81 Fuel use, carbon emissions and traffic congestion could be significantly reduced as the NBN reduces the need to travel by supporting more effective methods of tele-commuting for employees and students, and tele-presence for business meetings. The Committee welcomes the Federal Government's target in the *National Digital Economy Strategy* of doubling the rate of tele-working amongst Australian employees.<sup>96</sup> The Committee anticipates that further Government action in terms of public education and incentives may be required to meet this ambitious goal.
- 5.82 Underpinned by an effective and reliable communications network, smart grids have the potential to achieve significant cost savings and emission reductions across the electricity network. Smart grids will also enable electricity providers to better manage the distributed sources and fluctuating loads associated with renewable energies such as wind and solar. The Smart Grid, Smart City project underway in the Newcastle region promises to demonstrate to industry and the public how smart grids can operate on a commercial scale. As renewables continue to account for a larger proportion of Australia's energy supplies, the importance of smart grids will continue to grow. Leveraging the NBN will help enable smart grids to be deployed in more areas.
- 5.83 The NBN will provide the base communications network required to deploy intelligent sensor networks, including those used in transport and water management systems, in a range of locations around Australia. There are a number of exciting applications that will be made possible through these networks, including systems to improve asset and infrastructure monitoring, ease traffic congestion, improve agricultural

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95 Space Industry Innovation Council, Submission 73, p. 1.

96 DBCDE, *National Digital Economy Strategy*, May 2011, p. 41.

sustainability and enhance environmental monitoring services. The NBN's fibre network will provide the capacity to support high definition video monitoring and the backbone required to manage the extremely large amounts of aggregated data that will be generated.

- 5.84 The NBN will also enable spatial information, aerial mapping services, and satellite ground-station data to be more readily accessed by government agencies and the public, particularly in regional areas. Among the many potential benefits of this is the increased ability of authorities to respond to emergency situations and help individuals to make more informed decisions during natural disasters.
- 5.85 In many of the instances discussed in this chapter, the ubiquity and reliability of the broadband network are at least as important as the bandwidth. However, the high bandwidth capacity and scalability in the fibre components of the NBN will enable sensors and monitoring systems of increasing sophistication to be deployed.
- 5.86 The Committee also notes that while fibre-to-the-premises is the most energy efficient technology for high speed broadband, effort is required to ensure the significant environmental benefits of the network are not offset by unnecessary environmental costs. The NBN network itself will be a large consumer of energy and steps should be taken to ensure that the energy efficiencies of all the network's components are maximised. There is also potential for a large amount of electronic waste to be produced from obsolete equipment and back-up batteries, and the Committee encourages the development of environmentally sound policies to deal with this issue.

## Economic development and diversification

- 6.1 This chapter will look at the role and potential of the NBN for all businesses, but especially small and home-based businesses. In this context, the Committee will also consider the effects of the NBN in rural and regional Australia, especially in terms of economic development. The chapter will discuss the varied evidence on how the NBN will improve business efficiency, extend opportunities for the information technology industry and increase business revenue. The chapter then considers specific impacts in rural and regional Australia, including in terms of economic diversification, tourism, and agriculture, and benefits for sustainable regional development.

### **Improving business efficiency**

- 6.2 The Committee heard about ways in which the NBN presents opportunities for businesses to make improvements and efficiencies. These include the use of video-conferencing, tele-working, cloud computing, and voice-over-internet-protocol (VOIP), all considered below.

### **Video-conferencing**

- 6.3 The Committee heard from inquiry participants that the provision of high definition video-conferencing has the potential to revolutionise the way business is conducted, while, at the same time, significantly reducing costs for businesses. Video-conferencing was also discussed in Chapter 2 in relation to the provision of government services.
- 6.4 Video-conferencing was identified by both big and small business as an innovation that provided significant cost savings. A reduction in the need to travel, and the ability to demonstrate products and services to a client,

rather than just tell them over the telephone or via an e-mail, opens up many new possibilities for the conduct of business both domestically and internationally. Many businesses were already able to clearly identify cost savings, whether through the provision of training online, reducing overheads for the training organisation, or through reducing the costs of transport and accommodation for sales-based companies.

- 6.5 Mr Tony De Liseo, President of ICT Illawarra, stated that video-conferencing would enable more efficient training of staff than conducting face-to-face training. Further, he noted that some companies were foregoing staff training due to the prohibitive costs:

We now make up 30 per cent of our non-project billable hours in training. If the user experience is slow, we are being forced to deliver it face-to-face. That is just not possible. We do not have enough trainers and the cost of face-to-face training is very expensive. It is one thing for the university to talk about the fact that they specialise in face-to-face training, but, really, they are one trainer training classrooms of people. We often have to provide one trainer to one student. It is a huge expense, so companies are foregoing training. If they are foregoing training, the productivity of their staff is dropping.<sup>1</sup>

- 6.6 Mr De Liseo also reported to the Committee on the cost savings associated with providing training via video-conferencing, rather than face-to-face, stating there was an 80 per cent cost difference, 60 per cent of which was based on fees, with the remainder made up of other costs, such as time off work for travel.<sup>2</sup>

- 6.7 Cost savings through video-conferencing were also identified by Mr Darren Alexander, President of TASICT, who currently travelled overseas extensively for business purposes:

When you are small, you cannot grow because you need more work, so you physically have to travel all the time. I reckon I will save \$100 000 alone just in video-conferencing when I will be able to do that. I do not mean \$6 million video-conferencing; I mean high-definition, real video-conferencing that will allow me to interact with our customers and deliver services.<sup>3</sup>

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1 *Committee Hansard*, Wollongong, 28 April 2011, p. 14.

2 *Committee Hansard*, Wollongong, 28 April 2011, p. 17.

3 *Committee Hansard*, Hobart, 11 March 2011, p. 53.

- 6.8 Video-conferencing was also identified as a way of building customer relations, especially when dealing with foreign markets.<sup>4</sup> Mr Allen Bolaffi, Deputy Chair of the Southern Adelaide Economic Development Board, agreed that the full potential of video-conferencing had not been fully explored, suggesting it could be extended across services and industries as yet untouched by it.<sup>5</sup> The Department of Innovation, Industry, Science and Research (DIISR) noted that ‘improvements to communications through tools like video streaming will allow greater opportunities for networking and professional collaboration.’<sup>6</sup>
- 6.9 As mentioned in Chapter 2, tele-presence is an advanced form of video-conferencing that uses ‘high definition, high frame rate, low latency, immersive video conferencing facilities’ to simulate being in the same room as the person or group at the other end of the link.<sup>7</sup> Mr John Lindsay, General Manager of Regulatory and Corporate Affairs at Internode, told the Committee that his company uses tele-presence ‘between all its capital city offices’, saving it ‘hundreds of thousands of dollars a year’ in airfares and accommodation.<sup>8</sup> Mr Lindsay told the Committee that tele-presence is a ‘completely different way of working’, but noted:
- ... using tele-presence requires bandwidth that approaches 50 megabits. Today, that is affordable in a corporate setting but it is not really affordable in a domestic setting. The NBN will enable that.<sup>9</sup>

## Tele-working

- 6.10 While tele-working has been discussed in other chapters of this report in terms of social and environmental aspects, consideration here is given to the potential for savings and efficiencies in business, improving workplace participation and supporting regional development.
- 6.11 DIISR informed the Committee of a report on tele-working that found 24 per cent of small and medium sized businesses had used tele-work, with

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4 Ms Philippa Forrester, Chair, McLaren Vale Grape, Wine and Tourism Association, *Committee Hansard*, Victor Harbor, 5 April 2011, p. 31.

5 *Committee Hansard*, Victor Harbor, 5 April 2011, p. 29.

6 DIISR, *Submission 219*, p. 19.

7 CSIRO, *Submission 171*, pp. 5-6.

8 *Committee Hansard*, Adelaide, 4 April 2011, p. 6.

9 *Committee Hansard*, Adelaide, 4 April 2011, p. 6.

82 per cent reporting a positive impact, 17 per cent a neutral impact, and less than one percent a negative impact on their business from tele-work.<sup>10</sup>

6.12 The Committee heard from inquiry participants about the benefits to business from tele-working, hearing evidence that it will lead to increased productivity as employees are able to choose, to some extent, their hours of work.<sup>11</sup> The Committee also heard companies that offer the opportunity to tele-work have recruitment advantages, as employers are able to access skills available in other cities or even countries. It also gives organisations the opportunity to retain employees who may have to leave the area of the place of business for personal reasons.<sup>12</sup>

6.13 The ACT Government told the Committee that tele-working 'allows expertise to be used where it is needed regardless of the location of the worker', reducing the costs of office accommodation for employers and reducing time and travel costs for workers.<sup>13</sup>

6.14 Rising Sun Pictures identified affordable broadband as a way of not only reducing costs but also increasing the pool of quality workers available to the company:

We have pockets of artists all around Australia and, rather than sticking them on aeroplanes and flying them here, we could be either working with them as individuals or working with them in small clusters of two, three or four people and having located them in that area.<sup>14</sup>

6.15 The North Queensland Small Business Development Centre reported that they had a remote staff member based in Perth, and that another employee planned to retire to Brisbane, but would remain a part time employee working with remote access to the company's server.<sup>15</sup> This allowed the organisation to retain skills while also ensuring employee satisfaction.

6.16 Mr Peter O'Rourke of Shellharbour City Council suggested the growth of tele-work via the NBN would change behaviours, removing the need for some employees to commute. Mr O'Rourke compared the likely growth of

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10 Department of Innovation, Industry, Science and Research, *Submission 219*, p. 17.

11 Mr Mike Quigley, Chief Executive Officer, NBN Co, *Committee Hansard*, Sydney, 29 April 2011, pp. 6-7.

12 Mr Paul Nicholls, Director, Strategic Projects, Office of Research and Development, Curtin University, *Committee Hansard*, Perth, 5 May 2011, p. 19.

13 ACT Government, *Submission 227*, p. 10.

14 Mr Tony Clark, Director and Co-founder, *Committee Hansard*, Adelaide, 4 April 2011, p. 17.

15 Mr Brian Arnold, Chief Executive Officer, *Committee Hansard*, Townsville, 19 April 2011, p. 31.



businesses and employment around the NBN's infrastructure to that which happens when a significant freight-carrying road is built:

If you look at the M7, it carved its way through Western Sydney and it is a road. So what. But when you look at all the economic development that happened and the capacity and the ease with which businesses can relocate, there is another tick, another advantage of that sort of infrastructure. You look at the sustainability being improved because petrol is saved and trip times are saved and all sorts of things. I think at the local community level the NBN is going to have a similar influence in terms of shifting the whole culture in ways that we may not have yet anticipated.<sup>16</sup>

- 6.17 Mr John Grant of the Information Technology Industry Innovation Council (ITIIC) also identified the flexibility offered by tele-working, noting it was a choice about where someone worked, as well as to some extent being about when someone worked. Drawing on the experience of his own business, he explained that in addition to infrastructure, cultural change is needed to support tele-working, to change the mindset from one where 'work is a place I go' to 'work is a thing I do':

People talk about a blurred line between the personal and work, but there is no line at all. In fact it has all merged now because it can do, and it has done ...<sup>17</sup>

- 6.18 Mr De Liseo of ICT Illawarra indicated that tele-work would not completely remove the need for face-to-face contact in the conduct of business, as it was not possible for employees in all roles to work remotely. Mr De Liseo explained various instances where tele-work arrangements were successfully used, including where senior staff could work on projects using client computer systems 'during their down time, without cutting into their production time'. Mr De Liseo also noted that this had impacts for travelling time to and from the office, which is 'a lot safer for them and for us.'<sup>18</sup>

- 6.19 He also discussed the workplace participation benefits of tele-work with regard to the return to the workforce of new mothers:

Over 50 per cent of our workforce are women, and a lot of them do not want to do those late hours in our office. That is one of the

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16 Mr Peter O'Rourke, Director, Community Planning and Strategies, *Committee Hansard*, Wollongong, 28 April 2011, p. 45.

17 *Committee Hansard*, Brisbane, 18 April 2011, p. 31.

18 *Committee Hansard*, Wollongong, 28 April 2011, p. 18.

additional benefits of working from home. A lot of the women who work for us – three of our professionals – have recently had babies and they have been able to use that [flexible work arrangements].<sup>19</sup>

- 6.20 Mr Paul Nicholls of Curtin University agreed that the possibility of being able to tele-work would be a positive outcome for women, reducing the shortage of women in the workforce, and assisting in the retention of women in the workforce.<sup>20</sup>
- 6.21 Mr Fry of Ballarat ICT Ltd indicated that the future of tele-work would also include employees working *as* they commuted, requiring a quality broadband connection to service railway networks. He suggested an optical fibre connection would enable the rapid transfer of documents, improving the capacity of employees to work while they commuted.<sup>21</sup>
- 6.22 The Committee acknowledges the significant benefits that can be brought to a region's economic development by tele-working arrangements. These benefits are further considered later in this chapter, but the Committee notes evidence regarding some impacts of reduced commuting. Mr Pulford, representing the City of Ballarat, noted that while 'we very strongly aspire to have a regional economy not become a dormitory city', approximately 3000 people commute daily by train or car to Melbourne, and that many of those people also worked from home as part of their employment arrangements.<sup>22</sup> It was also noted that tele-work opportunities provided through the NBN would address some infrastructure pressures currently being experienced in Ballarat, namely car parking and commercial office space.<sup>23</sup>
- 6.23 Mr De Liseo advised the Committee that there were approximately 400 to 500 people working in the IT industry who commuted daily to Sydney from the Illawarra, and that there was no real reason they could not perform that work back in the Illawarra.<sup>24</sup> This reduction in the need to use modes of transport also eases traffic congestion and creates environmental benefits through reduced carbon emissions, as was discussed in Chapter 5.

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19 *Committee Hansard*, Wollongong, 28 April 2011, p. 18.

20 *Committee Hansard*, Perth, 5 May 2011, p. 19.

21 *Committee Hansard*, Ballarat, 17 March 2011, p. 27.

22 *Committee Hansard*, Ballarat, 17 March 2011, p. 7.

23 *Committee Hansard*, Ballarat, 17 March 2011, p. 8.

24 *Committee Hansard*, Wollongong, 28 April 2011, p. 19.

**Box 6.1 A practical example of tele-working**

The Committee heard from Mr Chris Hancock, CEO of AARNet and a self-described 'tree-changer'. As described in Chapters 4 and 7, AARNet is a large national organisation that provides broadband services to universities and other educational institutions.

Mr Hancock currently lives in Armidale, New South Wales, and only travels to Sydney weekly for face-to-face meeting. This is made possible by the use of high-definition video-conferencing equipment allowing multiple participants. He reported participating in 'at least four to six video-conferences a day'.

He commented that in order for tele-work via video-conferencing to become viable 'end-to-end throughput is really important. It is not only symmetrical – we cannot have any latency or any delay.' This is the type of broadband service that will become widely available with the NBN.

Source: Mr Chris Hancock, *Committee Hansard*, Canberra, 27 May 2011, pp. 29-30.

## Cloud computing

- 6.24 As discussed in Chapter 2 in the context of government services, cloud computing is the provision of consumer and business products, services and solutions delivered in real time over the internet. ICT Illawarra noted that the nature of computing was changing, and that 'real work' was being done on the internet now, rather than on computer hard drives, and that there had been an increase in people wanting to connect and run business applications via the internet, rather than over small, closed networks.<sup>25</sup>
- 6.25 As noted in Appendix E, cloud computing stores information in servers and provides that information as an 'on demand' service. Under cloud computing consumers can access all of their documents and data from any device with internet access such as a home or work PC or a mobile phone or other mobile internet enabled device.<sup>26</sup>
- 6.26 Computer Associates described cloud computing as the 'undisputed' future direction for the IT industry, and commercial and government entities, noting it will provide organisations with the ability to more

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25 *Committee Hansard*, Wollongong, 28 April 2011, p. 13.

26 Richard Hayes, *Valuing Broadband Benefits: A selective report on issues and options*, Melbourne Business School, University of Melbourne, 7 December 2010, p. 27.

effectively utilise their IT infrastructure and to consume IT as a utility, paying for only what is used on a monthly basis, delivering clear benefits for users.<sup>27</sup>

- 6.27 Computer Associates noted that latency in internet connections can have a ‘severe’ impact on complex cloud services, even rendering applications ‘inoperable’. It suggested the rollout of the NBN will assist in addressing this problem and will facilitate access to overseas service delivery, with the added benefit of providing a ‘sustainable competitive advantage’ for Australian cloud computing service providers.<sup>28</sup>
- 6.28 George Fong, Executive Director of Lateral Plains Pty Ltd, noted that while the concept of cloud computing may be considered new, his business had been assisting other businesses with multiple premises with similar solutions for a considerable period of time.<sup>29</sup> However, the NBN would present more of these opportunities and make it easier for business owners to pursue cloud solutions. Mr Fong also noted that there was a growth in these sorts of business opportunities with the growth of broadband internet services.<sup>30</sup>
- 6.29 Mr Alexander of TASICT reported on the productivity and cost benefits of cloud computing for small and home-based businesses:
- ... a lot of these businesses are family oriented and they are working from home, so they are currently using what they have now. If you look at cloud computing you see what benefits that would have for the SME [small and medium enterprise] market. Instead of going to buy all this hardware and all this software and actually using it, having to update it and regularly use it, they will be able to have a one-monthly fee service that they can run. Cloud already exists now but part of the problem is that Tasmania does not have the backhaul, so we do not have the infrastructure that allows us to do that in the high-capacity area.<sup>31</sup>
- 6.30 Mr Grant of the ITIIC also noted the financial shift offered by cloud computing:

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27 Computer Associates, *Submission 189*, p. 2.

28 Computer Associates, *Submission 189*, p. 3.

29 *Committee Hansard*, Ballarat, 17 March 2011, p. 38.

30 *Committee Hansard*, Ballarat, 17 March 2011, p. 38.

31 *Committee Hansard*, Hobart, 11 March 2011, p. 54.

In simple terms, cloud is about converting capex [capital expenditure] to opex [operating expenditure]; there is no doubt that the cloud service delivery model will allow that to occur.<sup>32</sup>

- 6.31 Smartnet identified good quality, high speed broadband as an enabler for small and medium enterprises (SMEs) to access cloud computing and to grow their businesses in markets outside of their immediate suburbs, accessing skills, products and customers, as well as support and investment to increase their productivity and competitiveness. It noted that SMEs who take advantage of these opportunities are enabled to:
- ... grow without many of the physical constraints with which they presently must grapple. This fundamentally underpins our ability to be more productive and competitive globally – which, of course in turn, directly impacts the quality and prosperity of communities and individuals.<sup>33</sup>
- 6.32 During a site inspection at Google Australia’s headquarters in Sydney, the Committee was given the opportunity to use new Google products called ‘Chromebooks’, which consist of a basic notebook computer with an internet browser installed. Using only the internet browser backed up by a reliable, high speed broadband service, a full range of standard desktop computing applications could be run and documents shared via the ‘cloud’, including email and calendar functions, word processing, spreadsheets and instant messaging.
- 6.33 Cloud computing also offers a radically different way for small and medium businesses to conduct themselves, and offers excellent opportunities to find cost savings. Rather than spending heavily on capital expenditure, the ability to use a wide range of services but only to pay for what is used offers significant savings for businesses.

## VOIP

- 6.34 Voice Over Internet Protocol (VOIP) was identified by many witnesses and submitters as a method of providing cost effective telephony to small business, reducing reliance on the traditional telephone system, and greatly reducing costs for small businesses, especially those that sought to do business overseas. Ms Pip Forrester of the McLaren Vale Grape, Wine and Tourism Association noted the advantages of VOIP to small and home-based businesses:

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32 *Committee Hansard*, Brisbane, 18 April 2011, p. 35.

33 Smartnet, *Submission 134*, pp. 5–6.

... lots of people say the new world is working from home, working remotely. They want to be able to work from home and access the internet from home. It is really important to secure VOIP. Some of them use it now but it is not very secure. Many of them that get this see this as a really incredibly good way to save a lot of money. A lot of them do a lot of international work, international phone calls, but also phone calls to these remote sites. They are all on the phone constantly. So they see VOIP as being one of the really big advantages.<sup>34</sup>

- 6.35 Mr Alexander of TASICT also identified VOIP as beneficial for small business, noting that it would be possible for a small business in Tasmania to communicate from points in Hobart and Launceston for free, using VOIP technology, rather than having to pay for it through traditional telephony.<sup>35</sup>
- 6.36 Mr Mark Frost, Director of On Q Communications, reported that VOIP would provide cost savings for small and medium businesses, while also increasing flexibility.<sup>36</sup>
- 6.37 At a site inspection of the Telstra Experience Centre in Sydney, Telstra demonstrated to the Committee a range of practical VOIP services being made available to small businesses through its Digital Business packages.
- 6.38 The Committee agrees that the use of VOIP can offer significant savings for business at a very low initial cost. Being able to communicate over an internet connection removes the need for a company to pay for a copper line rental as well as for internet access. A drastic reduction in telephony expenses is also extremely valuable to businesses in rural and regional areas, and businesses that do extensive business with overseas clients.

## **Supporting business growth**

- 6.39 The Committee heard from witnesses and submitters that the capacity to increase business revenues would be provided by the NBN, particularly by improving business access to export markets, by enabling more effective operation of home-based business, and by being able to take advantage of Australia's time zone in the operation of transnational businesses.
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34 *Committee Hansard*, Victor Harbor, 5 April 2011, p. 40.

35 *Committee Hansard*, Hobart, 11 March 2011, p. 54.

36 *Committee Hansard*, Townsville, 19 April 2011, pp. 34-35.

## Opportunities for high technology industries

6.40 Many sectors of the Australian economy are now dependent on the transfer of large volumes of information from one point to another in the conduct of their everyday business. Even the manufacturing sector is now heavily reliant on being able to access a network that can handle large amounts of data. The Committee heard of opportunities which may exist for smaller companies in these data-intensive fields to become rapidly competitive with larger firms and foreign competitors, for a comparatively low outlay for business.

6.41 The ITIIC noted that the NBN would support the local IT industry by enabling it develop applications that exploit the availability of high speed broadband:

... there is a considerable opportunity for the local IT Industry in developing software applications that exploit the availability of high speed broadband. Traditionally we have been great users but not producers of ICT, and the NBN provides the opportunity to shift this balance.<sup>37</sup>

6.42 Mr Adrian Young, Director of Sales at NearMap Pty Ltd, suggested that with the support of the NBN, users of his company's high resolution mapping product would be able to take advantage of its open source programming to develop a wide range of innovative applications:

In terms of how our customers would use our product in an NBN environment, we see huge applications ... We have an API [Application Programming Interface] which is open, which means developers can build all kinds of applications using our content and, in an NBN environment, that amplifies that substantially. Customers will be able to leverage our imagery in very powerful ways to build their business ... it will turbocharge the application of our product to innovation, to new product development and to research. So it is a serious shot in the arm in terms of how our customers would use our product. It is certainly a very nice fit with what we do.<sup>38</sup>

6.43 The Committee heard several examples of how high technology industries have to date relied on slow and inefficient means of transferring information. Mr De Liseo stated that it had taken approximately eight hours for him to transfer a file from Wollongong to Brisbane, and that

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37 ITIIC, *Submission 111*, p. 6.

38 *Committee Hansard*, Perth, 6 May 2011, p. 29.

through the course of a project, that data transfer would occur multiple times, meaning days of lost productivity, and that it was still faster to physically transport a file:

It is 2011 and the bandwidth of a 737 is still better than I can get to my home. This is where we are and that is what is limiting us.<sup>39</sup>

- 6.44 The ITIIC noted that the improved network capacity of the NBN will benefit Australian companies by enabling them access to software on demand. For example, the submission notes that modelling and simulation industries, such as computer aided design and engineering, depend on applications that often have 'heavy graphical input and output bandwidth requirements', meaning they are currently limited to localised and difficult to access facilities. The high bandwidth capacity of the NBN will greatly lower the cost of access to these applications, enabling small companies in these industries to 'compete with the larger companies in provision of services to a much wider customer population'.<sup>40</sup>
- 6.45 The ITIIC identified the Australian video game industry as a potential growth area,<sup>41</sup> reporting that it currently exports almost 100 per cent of its product, working with partners in the US, Europe and Asia, and that the NBN would improve these collaborative opportunities. Further, the Council reported that the delivery of video games to consumers had changed greatly recently, with the focus moving away from the physical medium of a DVD to full online downloads.<sup>42</sup> The provision of the NBN would enable Australian developers to improve the speed in which they were able to deliver their products to their clients.
- 6.46 Mr Brian Hales, Economic Development Advisor at the City of Onkaparinga, noted that while the manufacturing sector is increasingly 'fragmenting' and being outsourced overseas, design and prototyping are key elements where Australia can maintain its industry locally. He noted that local design would require 'big broadband capacity to send it interstate or internationally'.<sup>43</sup>

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39 *Committee Hansard*, Wollongong, 28 April 2011, p. 14.

40 ITIIC, *Submission 111*, p. 7.

41 The Committee also notes observations made by Michael Short writing for *The Age* that some of the world's pre-eminent gaming developers are based in Australia; there are more than 1600 Australian video game companies; the industry is growing by 15 per cent a year; and projected earnings are \$4 billion this year. See <<http://www.theage.com.au/opinion/society-and-culture/fun-and-games-20110807-1ihid.html>> viewed on 9 August 2011.

42 ITIIC, *Submission 111*, p. 8.

43 Mr Brian Hales, Economic Development Advisor, *Committee Hansard*, Victor Harbor, 5 April 2011, p. 37.



- 6.47 This was supported by Mr Geoff McQueen, board member of Regional Development Australia (RDA) Illawarra, who noted that design companies in the Illawarra region were constrained in their ability to transfer large files compared to other parts of Australia:

Some of the examples I am familiar with are things like engineering design outfits that are doing work from here, generating income and employing people here. Their customers are all over the place – in the Pilbara, in Queensland and internationally. They are having to ship a lot of big files around and they are having to do a lot of design work. They are constrained in a way that they would not be if they were in Surry Hills, Randwick or any other places of Sydney, or Melbourne, the Gold Coast, Brisbane, Geelong, Newcastle, Perth or Adelaide, that happen to have coaxial cable running past them already that can do speeds in excess of 100 [Mbit/s].<sup>44</sup>

- 6.48 Mr Alexander of TASICT, who operates a design company that specialises in colour marketing solutions for the paint and building products manufacturing industry, identified the NBN as enabling small to medium businesses to become more competitive in larger markets, as well as accessing international markets.<sup>45</sup> He also noted the ability to transfer files over broadband has already greatly lowered his company's costs, as it no longer relies on air freight to transfer files on discs. However, he said the rate of file transfer over DSL 'is still slow', and the benefits of providing faster broadband infrastructure would be considerable:

It is simple: time equals money. Small business operators understand that. It does not matter if they have a webpage, they are sending a catalogue or interactive video or they are showing their bed and breakfast in some small town; the access to data and allowing people to see it is going to allow those businesses to understand where the benefits are.<sup>46</sup>

- 6.49 DIISR told the Committee about the export potential of Australian IT skills, noting that the NBN would provide an opportunity for Australian IT professionals to more easily connect to the global software and applications market.<sup>47</sup>

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44 Mr Geoff McQueen, Board Member, *Committee Hansard*, Wollongong, 28 April 2011, p. 32.

45 *Committee Hansard*, Hobart, 11 March 2011, p. 51.

46 *Committee Hansard*, Hobart, 11 March 2011, pp. 63–64.

47 DIISR, *Submission 219*, p. 24.

- 6.50 The Committee was informed that there were particular opportunities for small business in local website hosting. Mr Bret Treasure, Member of the Australian Web Industry Association (AWIA), told the Committee that most hosting of Australian websites is currently done overseas. He said that the NBN would give the Australian IT industry the opportunity to offer faster hosting locally:

Then for the first time people could say, 'Here is an advantage – here is in a reason to host in Australia: you will actually get a faster loading time to website than you would get otherwise'. That has direct benefits not only in the users getting better experience but also in the fact that there are search-engine advantages in having that faster load time – Google rewards you for having fast load times; Google also rewards you for being hosted locally; if you have a .com.au and you are hosted locally, then that is going to help you in the rankings as well – so there are some side benefits to that.<sup>48</sup>

- 6.51 Mr Treasure also suggested that if some large cloud hosting services were operated in Australia, it would lead to lower bandwidth costs for Australian businesses:

When you look at something like Twitter photos they are hosted on S3 by Amazon overseas, so if they had a bank here – and obviously they will make a commercial decision about whether they will do that – then we would not need to use the bandwidth to download those photos every time we look at a photo on Twitter.<sup>49</sup>

- 6.52 Local hosting was also discussed by Mr Adrian Young of NearMap, who advised that his company was looking to scale its business internationally, and was approaching the point of having to decide whether his company wished to host and serve all its bandwidth-intensive content in Australia or overseas. Mr Young suggested that the competitiveness of the price of access to high-bandwidth connections under the NBN would be critical to this decision.<sup>50</sup>

- 6.53 Mr Alexander of TASICT also noted the potential of locating servers in Australia (and indeed, Tasmania) as being a way of reducing costs and improving efficiency in his business:

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48 *Committee Hansard*, 5 May 2011, Perth, p. 38.

49 *Committee Hansard*, Perth, 5 May 2011, p. 42.

50 *Committee Hansard*, Perth, 6 May 2011, p. 29.

... we currently have four servers that had to be set up in four different parts of the world. We cannot do it here in Tasmania, because we do not have the capability. We have four servers set up and we access and control them here but, if the NBN comes in, and I can have a data centre set up here, there is no reason I cannot do it all over Tasmania.<sup>51</sup>

- 6.54 The Committee sees the ability for Australian businesses to access affordable hosting onshore as a benefit of the NBN. It has the potential to increase speeds, improve the visibility of Australian businesses through search engines and also support a new sector of the IT industry in Australia. The Committee recognises that at present, it can be more cost effective for an Australian business to move their hosting offshore. The rollout of the NBN is likely to lead to growth in local hosting; sufficient speeds will become available to make an Australian hosting industry viable.

## Home-based businesses

- 6.55 DIISR described the home-based business sector in its submission as being 'diverse and complex'. It told the Committee about its own research which has found that home-based businesses vary greatly 'from building trades through to ICT consultancies', and the majority use a computer and internet as part of their operations. It also noted:

The research indicates a correlation between growth in business outcomes and ICT use. ICT is seen as important in this context as it allows these businesses to increase the scale of virtual operations without the costs associated with growth in physical operations.<sup>52</sup>

- 6.56 The Australian Bureau of Statistics (ABS) estimated that in June 2004, there were around 1 040 000 home-based business operators in Australia, representing 67.5 per cent of all small businesses. This proportion had increased from 58.3 per cent of businesses in February 1997.<sup>53</sup>
- 6.57 The Committee heard from several witnesses that obtaining comprehensive and up to date information on the number of home-based businesses was difficult, because many home-based business operators

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51 *Committee Hansard*, Hobart, 11 March 2011, p. 53.

52 DIISR, *Submission 219*, p. 22.

53 ABS, *Characteristics of Small Business (8217.0)*, 2004, p. 70.

prefer to ‘fly under the radar’.<sup>54</sup> For example, Ms Rhonda Hardy of Eastern Metropolitan Regional Council in Perth told the Committee:

A lot of them do not want to put their hands up ... and tell the local council and everyone that they are operating a local business for fear that suddenly they will have to put in extra toilets, disabled bays and this and that and refit their whole house to run their services ... We probably only know about 20 or 25 per cent of what our home businesses are up to in this country.<sup>55</sup>

6.58 However, some witnesses were able to provide useful approximations on the number and proportion of home-based businesses in their local areas. For example:

- Mr De Liseo of ICT Illawarra said that more than half of the people he deals with in the ICT field had started as home-based businesses.<sup>56</sup>
- Mr John McGee of the Tasmanian Department of Tourism, Economic Development and the Arts noted that of the 38 000 businesses in Tasmania, around 22 000 are sole traders, suggesting a high proportion are home-based.<sup>57</sup>
- Mr Bob Carmichael, Manager of Business and Economic Development at the City of Tea Tree Gully, informed the Committee that using conservative methods of approximation, 4125 of the 6000 businesses in his local government area are home-based. This equates to one business operating in every nine households, although Mr Carmichael noted that anecdotally the figure was closer to one in every seven households.<sup>58</sup>
- Mr Steven Harrison, Director of Business and Economic Development at the City of Prospect, said that Council research had found that around two in every three businesses advertising in their area are home-based.<sup>59</sup>

6.59 Mr Harrison went on to discuss the very wide variety of types of businesses being run from homes in his area:

54 Mr Robert Wallace, Chief Executive Officer, Tasmanian Chamber of Commerce and Industry, *Committee Hansard*, Hobart, 11 March 2011, p. 18; Mayor David O’Loughlin, City of Prospect, *Committee Hansard*, Adelaide, 4 April 2011, p. 66; Ms Rhonda Hardy, Director, Regional Services, Eastern Metropolitan Regional Council, *Committee Hansard*, Perth, 6 May 2011, p. 25.

55 *Committee Hansard*, Perth, 6 May 2011, p. 25.

56 *Committee Hansard*, Wollongong, 28 April 2011, p. 15.

57 *Committee Hansard*, Hobart, 11 March 2011, pp. 65–66.

58 *Committee Hansard*, Adelaide, 18 April 2011, p. 28.

59 *Committee Hansard*, Adelaide, 18 April 2011, p. 66.

A lot of builders, carpenters, electricians, plumbers, engineers and architects, people who need high bandwidth. One of the most surprising businesses down one of our side streets works for the UN and runs UN events on a global scale. She was in desperate need of optical fibre. She has paid to put her own optical fibre in since we found her. It was a real mixed bunch. They were very small businesses, one person: consultants, marketing communications people ...<sup>60</sup>

- 6.60 Mr Hales of the City of Onkaparinga in South Australia identified home-based businesses as a way of driving employment growth in the local economy. He described high-speed broadband as being a 'substantial attracter for employment' and suggested that the City of Onkaparinga would begin to heavily promote home-based business in areas connected to NBN fibre in the future.<sup>61</sup>
- 6.61 Mr Grant of the ITIIC noted that some small and home-based businesses had been developed exclusively over the web, and many of these were run by young people with no traditional understanding of business practices, leading to innovative behaviours:
- There are a lot of creative people ... they are all young people and they are doing things differently. They do not have the legacy of bricks and mortar real estate ... they are trained in the digital economy. That is where they operate. That is what tomorrow is, too, so we have to be part of that. We have to be decisively part of that.<sup>62</sup>
- 6.62 The North Queensland Small Business Development Centre (see Box 6.2 below) reported that some of the smaller businesses they had supported were using their connectivity to expand their businesses further afield. Mr Brian Arnold, the Centre's Chief Executive Officer, told the Committee about a local second hand clothing business that, before setting up a retail outlet at the Centre, had started at home using Facebook. It is now seeking to expand its franchise to other regional areas by selling second hand clothes through its website.<sup>63</sup>
- 6.63 At the inquiry's Wollongong hearing, RDA Illawarra told the Committee that home-based businesses in the region suffered because of a lower level

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60 *Committee Hansard*, Adelaide, 18 April 2011, p. 66.

61 *Committee Hansard*, Victor Harbor, 5 April 2011, p. 30.

62 *Committee Hansard*, Brisbane, 18 April 2011, p. 37.

63 Mr Arnold, *Committee Hansard*, Townsville, 19 April 2011, p. 32.

of connectivity impacting on their competitiveness with other cities.<sup>64</sup> The Committee heard that an acceptable level of ADSL service was not possible in many suburbs in the area due to the distances from the nearest exchange.<sup>65</sup> The RDA expressed optimism, however, that the rollout of the NBN would put these businesses 'on a level playing field' with their competitors.<sup>66</sup>

- 6.64 While it is difficult to quantify the exact size of the home-business sector, the evidence suggests it accounts for a growing majority of businesses operating in Australia. By making high speed broadband available to all premises in Australia, including fibre connections to 93 per cent of them, the Committee expects that the NBN will bring significant gains for this sector. Home-based businesses, located in all parts of the country, will be able to leverage NBN connections to up-size their operations and access new customers without facing the high overhead costs involved in setting up traditional 'bricks and mortar' outlets.

**Box 6.2 North Queensland Small Business Development Centre**

The North Queensland Small Business Development Centre was established to provide support to small businesses in the area around Townsville. It is located in a light industrial area and provides an NBN-level connection to all of its 35 tenants. It identifies its role as helping small businesses to make a soft transition from home-based to commercial premises.

The Townsville Home Business Group is also based in the centre—a group that aims to assist home-based businesses. The majority of the home-based businesses are operated by women, or 'mumpreneurs'. The majority of businesses are also web-based.

The Centre regards the NBN as key to the ability of small and home-based regional businesses to continue to grow. This includes networking, enhancing the customer base and establishing franchises in other regions.

Source: Mr Brian Arnold, *Committee Hansard*, Townsville, 19 April 2011.

64 Ms Natalie Burroughs, Chief Executive Officer, RDA Illawarra, *Committee Hansard*, Wollongong, 28 April 2011, p. 27.

65 Mr Geoff McQueen, Board Member, RDA Illawarra, *Committee Hansard*, Wollongong, 28 April 2011, p. 28.

66 Ms Burroughs, *Committee Hansard*, Wollongong, 28 April 2011, p. 27.

## Australia's geographic advantage

6.65 The Committee heard that Australia's geographical position and time zone hold some advantages in the provision of services for the foreign market, with Australia open for business while people in other parts of the world sleep.

6.66 At a public hearing in Perth, Ms Valerie Maxville told the Committee that Western Australia is nicely positioned between Europe and the United States to enable multi-national companies to continue their operations around the clock:

Some of the companies put their studios eight hours apart around the world. So anything that is not closed gets passed onto the next group, and they can have a 24 hour turnaround on developments.<sup>67</sup>

6.67 Mr Tony Clark, Director and Co-founder of the Adelaide-based visual effects company, Rising Sun Pictures (refer to Box Study 6.3), explained that his firm uses its *cineSync* online collaboration tool, underpinned by a private fibre broadband network, to take advantage of Australia's time zone while working on motion pictures:

This is what our clients do and they tell us repeatedly: they come in the morning and there is the delivery of all the things they have wanted from yesterday's review session sitting on their desktop waiting for them. They open those little movies, they give them to their editorial department, they show them to the director, they spend the whole day milling around talking about what people think about that work. At the end of the day, we wake up, go to the office, have a little sit down chat by video conference or typically just audio conference and *cineSync* session with our customers. We take their notes, which we turn around while they are in bed, they wake up the next day and the whole cycle continues. You will find that the time zone offset instead of being your enemy is actually your friend and is what is enabling you to service your customers better than you could if they were down the street from you.<sup>68</sup>

6.68 Mr Clark also informed the Committee that similar collaborations across time zones are taking place in the medical field. The example he gave is

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67 *Committee Hansard*, Perth, 5 May 2011, pp. 28–29.

68 *Committee Hansard*, Adelaide, 4 April 2011, p. 23.

that there is radiography that is being analysed in Australia as 'night shift' work for the United States.<sup>69</sup>

- 6.69 Mr Brett Biddington, a member of the Space Industry Innovation Council, told the Committee that Australia has strategic advantages from being 'essentially equidistant around the globe from the United States and Europe' and also being in the Southern Hemisphere (unlike the major space-industry nations), making it ideally placed for hosting satellite ground stations to support services requiring '24/7 coverage'.<sup>70</sup>
- 6.70 The Committee notes with interest that Australia's geographic position can be turned from a negative into a positive by high speed broadband. As the above examples indicate, there are a wide range of fields in which Australian companies could take advantage of time zone offsets to provide potentially lucrative services to much larger markets in Europe and the United States. The Committee recognises that these services all require the ability to quickly transmit large amounts of data, and the NBN will enable this type of connectivity to become available to many more businesses that it is currently.

**Box 6.3** Rising Sun Pictures

Rising Sun Pictures is a film and television visual effects company based in Adelaide that works principally on Hollywood feature films. When the company began operations with just four staff, they were required to courier work on tapes to the United States, which took approximately four days. The client would then review the tape and call Rising Sun to talk through any changes.

Facilitated by the availability of fast broadband (funded by the South Australian Government), Rising Sun developed 'cineSync', an award winning collaboration technology. CineSync allows Rising Sun and its remote clients to look at a shared visual context and point at items on the screen, enabling the users to collaborate effectively. CineSync has been used films such as Avatar and the Harry Potter series, and has helped the movie industry to grow outside of the United States.

Rising Sun now employs 140 staff and sends hundreds of gigabytes of data over fast broadband every day.

Source: Mr Tony Clark, *Committee Hansard*, Adelaide, 4 April 2011.

69 *Committee Hansard*, Adelaide, 4 April 2011, p. 22.

70 *Committee Hansard*, Canberra, 27 May 2011, p. 33.



## NBN impacts for regional development

- 6.71 The Committee received more than 75 submissions from Regional Development Australia committees (RDAs), rural and regional councils, and other rural and regional groups, constituting almost a third of submissions made to the Committee. These submissions were overwhelmingly supportive of the rollout of the NBN, identifying it as a transformative piece of infrastructure that would go some way to ameliorating the tyranny of distance that has long been a problem for rural and regional communities.
- 6.72 Many of the potential impacts of the NBN discussed in other chapters (for example, in the health, education, and government services sectors) will extend positive benefits to rural and regional areas. This chapter focuses on the NBN's capacity to support **economic growth and employment** in those places. The Committee heard about the ways in which economic development in regions and better business outcomes could be mutually reinforced.
- 6.73 While specific outcomes and benefits of the NBN for particular sectors, such as health and education, have been discussed earlier in this report, it should be noted that evidence also outlined other positive consequences that could be felt in rural communities following the availability of NBN applications in those sectors. For example, medical treatment may require a patient to travel to a major regional city, or a capital city. Mr O'Halloran, of the Wheatbelt East Regional Organisation of Councils, explained that those people are often accompanied by members of their immediate families, which means that their home towns forego the economic benefit of that family shopping locally.<sup>71</sup> The availability of rehabilitation treatment and support via NBN applications may enable these people to not only return home more quickly, and recover from illness with appropriate support, but ensure that their home town doesn't suffer the ongoing economic consequences of their absence.
- 6.74 These positive consequences can also be observed in education sector. One of the primary benefits to education identified for rural and regional Australia was the ability to provide remote training for employees, negating the need to spend time and money to send employees to major centres to receive further vocational training. Mr Shenal Basnayake, Economic Development Officer at the Cassowary Coast Regional Council,

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71 Mr Stephen O'Halloran, Wheatbelt East Regional Organisation of Councils, *Committee Hansard*, Perth, 6 May 2011, p. 20.

noted the ability to provide in-house training would act as a great enabler for local businesses while also making productivity gains.<sup>72</sup>

- 6.75 The Committee notes the concerns raised by many inquiry participants about declining youth populations in regional and remote communities, and the social and economic impacts felt across several sectors, including agriculture. As discussed in Chapter 3 on Education, by improving access to educational options, the NBN could help retain young people in rural and regional areas. The Committee recognises that this could lead to significant economic benefits for these areas.
- 6.76 Elsewhere in the report, some consideration is given to evidence received by the Committee as to the positive benefits the NBN will bring to the Australian tourism sector. In this chapter, the focus will be on the impact of those improvements which may be experienced from the perspectives of rural and regional communities. Similarly, the impacts of some NBN applications in the agriculture sector are discussed in Chapter 5, as part of the consideration about environmental benefits of improved sensing and monitoring; the focus in this chapter will extend to the benefits anticipated for the economic sustainability and development of Australia's agricultural communities and productive industries.
- 6.77 Across all of these areas, the Committee heard many views from inquiry participants as to the role of governments; greater consideration to these aspects are concentrated in chapter 10.

### Constraints on business by current service

- 6.78 Mr Geoff McQueen of RDA Illawarra expressed enthusiasm about what local businesses were achieving through use of information technology and the internet. He noted however that some local organisations were starting to feel constrained in what they could do due to the lack of bandwidth through existing internet connections, and were unable to spend significantly more on higher capacity services.<sup>73</sup>
- 6.79 The Committee received extensive evidence noting that current services to rural and regional areas were inadequate for the needs of end users. It heard that some Australians in rural areas are still using dial up internet services, and even travelling to another location to access faster internet services.<sup>74</sup> Extensive evidence of blackspots was also provided to the

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72 Mr Shenal Basnayake, *Committee Hansard*, Townsville, 19 April 2011, p. 50.

73 *Committee Hansard*, Wollongong, 28 April 2011, p. 24.

74 Ms Hardy, *Committee Hansard*, Perth, 6 May 2011, p. 25.

Committee, including areas very close to major population centres. These inadequate services also extended to basic access to telephony, with the Committee hearing of inadequate landline telephone access, and poor quality mobile phone access.<sup>75</sup>

- 6.80 The Committee was also informed by inquiry contributors that the services they currently accessed were expensive compared to those available to consumers in cities and urban centres.
- 6.81 AgForce Queensland identified distance as the cause of high costs and poor services to regional and remote Australia, noting that gaps would exist in the availability of 'normal' broadband through ADSL until the NBN was completed, as there was not existing infrastructure to support universal broadband in regional areas.<sup>76</sup> Mr Robert Walker, Chief Executive Officer of AgForce Queensland, noted that his organisation still used postal services and facsimiles to send documents to some members due to a complete lack of internet access, or a lack of education in how to access these services.<sup>77</sup>
- 6.82 The Committee heard that even in a large, regional centre, there were still blackspots in the coverage currently provided, and that an initial inquiry made by business owners who were considering relocation to Ballarat regarded the level of data access which could be expected.<sup>78</sup>
- 6.83 Access to cheaper, better quality services at prices competitive to those offered in metropolitan areas was identified by several witnesses as an attractive element of the NBN for regional areas. For example, Mr Alexander of TASICT remarked:
- This is the first time that these centres will have investment that allows for business growth and provides an opportunity for younger people to stay in these regional centres. Effectively, the NBN technology will breathe life back into regional centres and allow them to operate more on par with the metropolitan areas.<sup>79</sup>
- 6.84 The Committee heard evidence that suggested the NBN would have significant impacts on rural and regional businesses, either through

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75 Indigenous Remote Communications Association (IRCA), *Submission 82*, p. 7; Ms Mel King, Research Officer, Tasmanian Farmers and Graziers Association, *Committee Hansard*, Launceston, 10 March 2011, p. 42.

76 AgForce Queensland, *Submission 24*, pp. 3–4.

77 *Committee Hansard*, Brisbane, 18 April 2011, p. 39.

78 Mr Jeff Pulford, Director of Destinations and Connections, City of Ballarat, *Committee Hansard*, Ballarat, 17 March 2011, p. 12.

79 *Committee Hansard*, Hobart, 11 March 2011, p. 50.

providing those businesses with the infrastructure required to be more competitive with businesses in major cities or overseas, or by enabling businesses to relocate to regional centres due to reduced overheads.

## Regional service hubs

6.85 The City of Ballarat identified itself as a services hub for the region, and explained that broadband provided through the NBN would constitute an essential part of the city's plan to fulfil this role.<sup>80</sup>

6.86 However, the City of Ballarat also noted that while it saw itself as the hub for economic activity, it also sought to preserve economic activity elsewhere in the region:

We are trying to avoid the absorption of economic activity from the region into Ballarat. We understand that in Ballarat we need to provide a foundation level of services and economic activity to support the region, but we very much support maintaining and developing industry sectors and businesses more broadly within the region. We see that there are strengths right across the region in different parts of the region that support various businesses. The feedback that was provided to the regional planning committee, which developed the strategic regional plan through community symposiums, was about the ability of businesses to remain based in small rural towns and nice businesses to be able to be developed out of homes, or vineyards, or whatever those activities are through the use of broadband and very fast internet.<sup>81</sup>

6.87 Mr Pulford, of the City of Ballarat, identified strong development of the ICT sector as vital to the growth of the region in more traditional sectors, such as manufacturing:

Through the Federal Government there is about to be a centre for manufacturing excellence built in Ballarat. That says that manufacturing is critical for Ballarat's economy. The connection that we want to make for the purposes of today's discussion is around ICT as an enabler for manufacturing and the commercialization or opening up of the intellectual property universities. The council is currently engaged in a very detailed process with the universities and the manufacturing sector using

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80 Mr Anthony Schinck, Chief Executive Officer, *Committee Hansard*, Ballarat, 17 March 2011, p. 2.

81 Mr Schinck, *Committee Hansard*, Ballarat, 17 March 2011, p. 6.

ICT as a key enabler. It is one of those opportunities, where, for us, while ICT is probably the seventh largest sector of our economy, it is fundamental to what actually makes our economy strong and vibrant.<sup>82</sup>

- 6.88 The City of Geraldton-Greenough saw itself as a similar hub for regional Western Australia. Mr Tony Brun, the city's Chief Executive Officer, explained that in the NBN's network architecture Geraldton would effectively become 'the exchange for the whole of WA'. He noted this would bring opportunities for the city to exploit both in ICT and as a logistics, service and data centre for the resources sector.<sup>83</sup>

## Attracting and growing businesses

- 6.89 The Committee received a range of evidence that the NBN could play a key role in attracting businesses to set up new operations in regional centres, leading to positive employment outcomes for those communities. For example, the Eastern Regional Corridor submission stated that:

The NBN will also reduce the impact of geographical inequalities on economic productivity and growth and enable the region to become a viable location for existing firms from outside the area to establish operations. This is already happening slowly as business owners and staff opt for a better quality of life away from capital city congestion.<sup>84</sup>

- 6.90 AgForce Queensland noted that the NBN would provide significant cost savings to rural and regional businesses by making communication faster and cheaper, resulting in increased revenue which could be used to grow businesses and to grow regional economies. It would also enable companies to expand and still remain in their local community, or to attract established companies to rural and regional areas.<sup>85</sup>
- 6.91 Kiama Municipal Council advised the Committee that there were restrictions on large businesses operating within the local government area, but that the Council's economic plan aimed to attract high-end professionals seeking to relocate from Sydney. Mr Christopher Quigley, the Council's Director of Strategic and Commercial Services, suggested that the NBN would enable the Council to attract architects, graphic

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82 *Committee Hansard*, Ballarat, 17 March 2011, p. 5.

83 Mr Tony Brun, Chief Executive Officer, *Committee Hansard*, Perth, 6 May 2011, p. 4.

84 Eastern Regional Corridor, *Submission 141*, p. 23.

85 AgForce Queensland, *Submission 24*, p. 10.

designers and other workers in similar fields to operate small businesses in the region.<sup>86</sup>

- 6.92 The Committee heard that regional areas often used their lifestyle benefits as a way to attract professionals who are able to use technology to continue to work away from big cities.<sup>87</sup> Attracting these professionals with infrastructure such as the NBN has the potential to increase employment in regional areas as businesses grow.
- 6.93 Mr Paul Lange, Member of the Australian Council for Private Education and Training (ACPET), told the Committee that he chooses to run his online training organisation from Cairns due to the lifestyle there. However, three quarters of the company's 60 staff work remotely from locations 'all over Australia' by using broadband connections with VOIP and video links. Mr Lange noted that despite being in a regional location, this enables the company to employ 'quality people' who would not necessarily be available in the immediate area.<sup>88</sup>
- 6.94 Mr Clark told the Committee that Rising Sun Pictures had benefited greatly from Cinenet, a state government-funded private fibre network for the major businesses in his sector. He indicated that had this technology not been available to support and grow the business, it would have had to have relocated to the United States.<sup>89</sup>
- 6.95 The Committee expects that as the NBN continues to be rolled out, more and more businesses will take advantage of the flexibility to base themselves in the locations of their choice while remaining highly competitive in markets both locally and overseas. The Committee was interested to hear that since the NBN has been deployed in the small town of Scottsdale in rural Tasmania, at least two businesses have already moved there from interstate specifically to take advantage of its fast broadband connectivity.<sup>90</sup>

## Economic diversification

- 6.96 Diversification of local economies was often emphasised by contributors to the inquiry from rural and regional areas, who, while proud of their

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86 *Committee Hansard*, Wollongong, 28 April 2011, p. 47.

87 Mr Basnayake, Cassowary Coast Regional Council, *Committee Hansard*, Townsville, 19 April 2011, p. 48.

88 *Committee Hansard*, Canberra, 4 March 2011, p. 41.

89 *Committee Hansard*, Adelaide, 4 April 2011, pp. 14, 16.

90 Ms Ally Mercer, Sustainable Development Manager, Dorset Council, *Committee Hansard*, Launceston, 10 March 2011, p. 6.

local traditional industries, had sought to expand into different areas and saw the potential of the NBN as an enabling tool for diversification.<sup>91</sup> The Committee heard that this could help regional economies become more sustainable.<sup>92</sup>

6.97 The comparative advantage of regional and rural communities was also emphasised, with one witness noting that lower costs and a higher quality of life could act as drivers to attract industries away from metropolitan areas and increase rural and regional populations in communities that would otherwise be dependent on 'monoculture' traditional industries.<sup>93</sup>

6.98 The National Farmers' Federation (NFF) noted the opportunity the NBN provided to build and diversify regional economies while encouraging the decentralisation of businesses and services, suggesting there should be a strong focus on encouraging development and diversification of regional economies during the rollout of the NBN.<sup>94</sup> The New South Wales Farmers' Federation noted:

The ability to earn off-farm income through online businesses is very important to our Members. Diversification of income is a common goal of many farm businesses, and the NBN will provide the much needed opportunity to run online businesses in nearly any industry.<sup>95</sup>

6.99 The Committee was informed by witnesses and submitters that the rollout of the NBN had the potential to provide jobs in rural and regional communities, and to give young people the opportunity to access on-the-job training and experience in skills that would be transferable to other areas, addressing some of Australia's skills shortages.<sup>96</sup> Shellharbour City Council noted the job generation that had occurred at the trial site in neighbouring Kiama.<sup>97</sup>

6.100 Wollongong City Council agreed, identifying the NBN as presenting excellent job opportunities, especially for the young people of the area. The council noted the decline of the coal and steel industries in the

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91 Mrs Karen Hall, President, North East Tasmania Chamber of Commerce, *Committee Hansard*, Launceston, 10 March 2011, p. 13.

92 Mr Bolaffi, Southern Adelaide Economic Development Board, *Committee Hansard*, Victor Harbor, 5 April 2011, p. 27.

93 Mr Gregory Powell, Member and Council Representative, Wheatbelt East Regional Organisation of Councils, *Committee Hansard*, Perth, 6 May 2011, p. 24.

94 NFF, *Submission 197*, p. 3.

95 New South Wales Farmers' Association, *Submission 182*, p. [3].

96 Mr Quigley, Kiama Municipal Council, *Committee Hansard*, Wollongong, 28 April 2011, p. 49.

97 Mr Peter O'Rourke, *Committee Hansard*, Wollongong, 28 April 2011, p. 1.

Illawarra had lead to higher than average unemployment, and reduced employment opportunities for young people. The council reported that there had been attempts to diversify the economic base of Wollongong and the Illawarra, especially in the tertiary education and financial sectors, and that the NBN would enable these sectors to continue to grow, and compete on an equal footing with competitors based nationally and internationally.<sup>98</sup>

- 6.101 It was also noted by witnesses that the opportunities provided by the NBN enabled smaller businesses in regional areas to promote themselves and to connect more easily with their communities.<sup>99</sup>

## Exporting to other markets

- 6.102 The Committee heard that there were significant constraints on rural and regional businesses being able to access foreign export markets due to insufficient internet services in these areas, and that the NBN would perform a transformative role in this area. Mr Basnayake of the Cassowary Coast Regional Council, noting that his region has the largest amount of tropical fruits grown in Australia, described the situation of one grower who had sought to engage in foreign markets:

How do we enable him to export? He has to have a web presence. He has to be engaged with foreign markets. He has to be able to have real-time access to information to respond to inquiries and things like that. The NBN will provide such a benefit not just to him but to all the businesses.<sup>100</sup>

- 6.103 Mr Basnayake continued:

It is about enabling them to export. It is giving them access to real-time information. You could access the stock exchanges, the markets, and see price fluctuations in what the dollar is doing. Things like that are important for these businesses. Reading the newspaper or reading the *Financial Review* the next day is not going to help you if you had to deal with something the day before. Having access to that information, being able to connect, is what I am talking about, and getting your product out there.<sup>101</sup>

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98 Mr Farmer, *Committee Hansard*, Wollongong, 28 April 2011, p. 42.

99 Mr Basanyake, Cassowary Coast Regional Council, *Committee Hansard*, Townsville, 19 April 2011, p. 46.

100 *Committee Hansard*, Townsville, 19 April 2011, p. 51.

101 *Committee Hansard*, Townsville, 19 April 2011, p. 52.



- 6.104 RDA Townsville and North West Queensland also identified the potential for engaging in export markets that would be opened up by the NBN. They reported an expectation of rapid growth in the region due to the mining industry and food export production demands. Further, it was noted that the arable parts of the region were very close to ports, enabling rapid harvest and transportation.<sup>102</sup>
- 6.105 Mr Paul Nicholls of Curtin University noted the capacity of the NBN to enable regional businesses to access larger markets in other cities or overseas, suggesting a \$5 million business in Western Australia could become a \$50 million business if it had access to foreign markets via technology such as the NBN.<sup>103</sup>
- 6.106 The Committee was informed of innovations in the wine industry, with a wine-maker in McLaren Vale using video-conferencing technology to conduct 'virtual wine tastings'. The winemaker and potential buyers overseas would taste a package of wines together and discuss them remotely, strengthening ties between the winemaker and his customer and reducing the need to travel. However, connectivity was currently constraining the success of this innovation; images and sound were not transmitting smoothly.<sup>104</sup>
- 6.107 Mr Alexander of TASICT told the Committee that his own business exports around 50 per cent of its products all over the world, from its base in Launceston. Mr Alexander explained that because his work all uses rich media, he currently spends a very large amount of time and money travelling, and estimates he will save \$100 000 a year on travel expenses if he is instead able to use high-quality video-conferencing to engage with his export clients.<sup>105</sup>

## Supporting tourism

- 6.108 The Department of Resources, Energy and Tourism (RET) submitted that tourism contributes \$34 billion Australia's economy, employs more than 500 500 people, and comprises 93 per cent micro to small sized businesses.

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102 Mr Ron McCullough, *Committee Hansard*, Townsville, 19 April 2011, p. 41.

103 *Committee Hansard*, Perth, 5 May 2011, p. 24.

104 Ms Forrester, McLaren Vale Grape, Wine and Tourism Association, *Committee Hansard*, Victor Harbor, 6 April 2011, p. 31; 'High speed broadband a barrel of success', *Southern Times Messenger*, 25 January 2011.

105 *Committee Hansard*, Hobart, 11 March 2011, p. 53.

It noted that 46 cents in every dollar tourism expenditure is spent in regional areas.<sup>106</sup>

- 6.109 The Committee notes that, as part of a National Long Term Tourism Strategy, a Digital Distribution Working Group has been set up to 'encourage more small and medium tourism enterprises to accelerate online distribution of their tourism product, improve online presence and capability'. Currently, although 85 per cent of tourism operators have a website, only 35 per cent have online booking and payment facilities.<sup>107</sup> RET advised that the NBN will 'enable businesses to develop data rich websites, showing video and high-resolution images of products and services as well as allowing access to increasingly sophisticated applications'.<sup>108</sup>
- 6.110 The National Tourism Alliance informed the Committee that at a time when the tourism industry is undergoing a period of transformation, access to high speed broadband internet is becoming more 'critical to the future success of the tourism sector' as customers increasingly use the internet for tourism research, bookings and payments. The NTA noted that:
- The NBN provides opportunities for tourism businesses to distribute their products online more effectively, through high quality websites, and thereby compete and conduct business on a global scale in new markets, particularly from Australian regional and remote areas who may not have had a cost-effective online opportunity in the past.<sup>109</sup>
- 6.111 Mr Basnayake of Cassowary Coast Regional Council noted that having effective broadband services was of particular importance to the tourism industry, which represents a significant part of the regional economy. The region contains backpacker hostels which provide accommodation for workers in the banana plantations. He reported that there was clearly a lack of broadband availability in the area, as evidenced by the popularity of wireless internet connections at fast food restaurants and libraries.<sup>110</sup>
- 6.112 The Committee heard that tourists have come to expect the provision of internet services, as they have become reliant on e-mail and social networking sites to maintain a connection with home while they travel.

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106 RET, *Supplementary Submission 190.1*, p. 1.

107 RET, *Supplementary Submission 190.1*, pp. 1-2; NTA, *Submission 235*, p. 2.

108 RET, *Supplementary Submission 190.1*, p. 3.

109 NTA, *Submission 235*, pp. 1-2.

110 Mr Basnayake, *Committee Hansard*, Townsville, 19 April 2011. p. 47.

For example, Mr Andrew Connor, Spokesperson for Digital Tasmania, observed:

Some people want to get away from it all, but some people still want to stay connected to everything. They want to upload their holiday videos and pictures to their friends so they can see them instantly.<sup>111</sup>

- 6.113 Mr Basnayake noted that while some tourism operators around Mission Beach had an excellent web presence, the smaller tourism operators and caravan parks did not, and suffered as a result. He noted that those smaller businesses relied heavily upon 'drive tourism' and were unable to access markets beyond that because of an inadequate web presence. Mr Basnayake described the 'chicken and egg situation' where slow internet speeds meant a lack of ICT expertise in the area which meant that businesses were not easily able to access assistance to design and establish a better web presence.<sup>112</sup>
- 6.114 The McLaren Vale Grape, Wine and Tourism Association informed the Committee that the tourism sector in its region was acutely aware of their dependence on the internet. The vast majority of tourism operators were small businesses operating bed and breakfasts that handled more than 90 per cent of their bookings online, and expected increased occupancy rates once they were able to harness the potential of the NBN to grow and promote their businesses.<sup>113</sup>
- 6.115 The Eastern Metropolitan Regional Council in Western Australia also told the Committee of its aspirations to increase tourism to the area by promoting the area as a haven for natural and conventional health treatments, and that there was a desire to implement a system in which tourists could book customisable packages online, but that this would require adequate ICT support and infrastructure to enable adequate collaboration.<sup>114</sup>
- 6.116 The Committee was interested to hear the ways in which the web was being used to promote the tourism sector in Ballarat. More than half of the tourism sector in Ballarat is based around home-based tourism services, mostly bed and breakfast providers. The City of Ballarat advised that they had worked with the local tourism sector and had invested more than \$1 million in developing, for the first time, an integrated booking system for

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111 *Committee Hansard*, Launceston, 10 March 2011, p. 29.

112 *Committee Hansard*, Townsville, 19 April 2011, p. 48.

113 Ms Forrester, *Committee Hansard*, Victor Harbor, 5 April 2011, pp. 44–45.

114 Ms Hardy, *Committee Hansard*, Perth, 6 May 2011, p. 26.

bed and breakfast providers around Ballarat, ‘which sounds minimal’, but which has resulted in a substantial improvement in the marketing of the city:

... We now have an integrated place for people to go. It has also meant that for businesses their booking systems are running much more seamlessly than they might have otherwise.<sup>115</sup>

## Supporting agriculture

6.117 Agriculture is clearly another particularly important industry to many rural areas. As noted earlier, Chapter 5 of this report discussed a number of innovative agricultural applications of the NBN in the context of using sensors to monitor infrastructure and the environment. This section will explore some broader agricultural applications.

6.118 The Australian Information Industry Association (AIIA) submitted that broadband access can stimulate new employment and improve the sustainability and profitability of traditional industries like agriculture:

For a country such as Australia with a deep export history in agriculture and resource extraction, access to high speed broadband through the NBN has the potential to both open new business and investment opportunities as well as build on our traditional strengths.<sup>116</sup>

6.119 The NSW Farmers’ Association informed the Committee of the importance of broadband-related technologies for enabling more efficient farm operations:

Popular uses by farming businesses include weather forecasting, purchasing equipment online, trading commodities, determining soil moisture and calculating efficient fertiliser content. The ability to email from the paddock, turn off irrigation remotely and monitor farms through satellite imagery has increased the profits and productivity of those able to access it.<sup>117</sup>

6.120 AgForce Queensland informed the Committee that there had been a significant increase in the average age of primary producers in Queensland, especially in the dairy industry. It noted that young people were leaving rural and regional Queensland due to a lack of educational opportunities, and a lack of drivers to retain young people in their

115 Mr Pulford, *Committee Hansard*, Ballarat, 17 March 2011, p. 6.

116 AIIA, *Submission 184*, p. 17.

117 NSW Farmer’s Association, *Submission 182*, p. 7.

communities, and noted that this was clearly due to a lack of technology.<sup>118</sup>

- 6.121 AgForce Queensland told the Committee that farmers could use broadband both to manage their operations and to access better information, such as weather reports and market information. AgForce particularly emphasised in its submission the ways in which access to this information would lead to more environmentally sustainable farm practices, 'as well as a system to network and manage on-farm technology which is used in everyday operation.'<sup>119</sup>
- 6.122 Mr Walker also reported that industry was driving technological changes in farming, and that Australia was leading the way in many of the technologies being used.<sup>120</sup> This was supported by the National Farmers' Federation, who agreed that agricultural industries had a significant engagement with research and development, and that the NBN may offer opportunities for innovation not previously considered.<sup>121</sup>
- 6.123 The Cassowary Coast Regional Council noted the provision of quality video streaming services would enable agencies such as the Australian Quarantine and Inspection Service, Customs, and the Department of Primary Industries to assess products remotely.<sup>122</sup>

## Committee conclusions

- 6.124 It is clear to the Committee that some businesses have outgrown the traditional internet infrastructure available in Australia, and are seeking to incorporate more efficient methods of conducting operations, including by using technologies which are supported by an effective and reliable broadband network. The Committee heard that in order to successfully use applications such as video-conferencing and VOIP, to access cloud computing and tele-working arrangements, and to make the most of the advantages offered by Australia's time zone, Australian home-based businesses and other small and medium enterprises will require the NBN.
- 6.125 The Committee accepts the views of inquiry participants about the possibilities offered through tele-working arrangements, particularly with

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118 Mr Robert Walker, *Committee Hansard*, 18 April 2011, p. 39.

119 AgForce Queensland, *Submission 24*, p. 9.

120 Mr Robert Walker, *Committee Hansard*, 18 April 2011, p. 44.

121 National Farmers' Federation, *Submission 197*, p. 4.

122 Mr Shenal Basnayake, *Committee Hansard*, 19 April 2011, p. 52.

regard to improving productivity and access to skilled workers. From a regional perspective, the ability to tele-work also presents rural and regional Australia with a competitive advantage against bigger population centres. Rural and regional Australia can offer a completely different quality of life when compared to cities, but the lack of employment opportunities has long made choosing to move to a rural or regional location a difficult decision for people who live in cities because of their employment circumstances. The Committee considers that the NBN affords the possibility of regional economic diversification, allowing towns to attract smaller businesses which may then expand locally, providing more traditional employment to locals.

- 6.126 The Committee was also interested to hear of the benefits provided by the NBN to small rural and regional businesses seeking to expand and even compete overseas. It was noted by many inquiry participants that rural and regional economies were often heavily dependent on one or two specific industries, and that these economies were often placed under significant strain due to natural disasters. However, the NBN would provide rural and regional small business with the opportunity to broaden their customer bases and to grow their businesses, provide further employment, and to support regional economies sustainably.
- 6.127 The Committee was interested to hear the role technology can and is playing in the tourism and agricultural sectors, and the particular impacts in these industries in rural and regional Australia. The Committee heard concrete examples of the role the NBN could play in supporting small businesses across Australia, and encourages other councils and regional groups to examine the innovations of councils in their support of local tourism. For the agricultural industry, there are also significant benefits arising from the provision of ubiquitous high speed broadband. Electronic telemetry and real time market information provide farmers with opportunities to greatly improve productivity and competitiveness, and benefits of the NBN through, for example, the education sector, may assist small communities to retain their younger populations, thereby also assisting in the economic development and sustenance of those places.
- 6.128 The Committee notes that the speeds provided by the NBN will vary, depending on whether a user is connected to fibre, wireless, or a satellite service, and notes the desire from many rural and regional Australians to be connected to the fibre network. The issues around this are discussed in Chapters 9 and 11.

## Research and innovation

- 7.1 This chapter discusses the capacity of the NBN to contribute to the research and development (R&D) conducted by both public research institutions and by private industry. It primarily addresses term of reference (g), focusing on the NBN's 'interaction with research and development and related innovation investments'.
- 7.2 The Committee heard that while most major research facilities already have a high level of connectivity through existing fibre networks, the NBN will enable research to take place in a wider range of locations and improve the ability of researchers to collaborate with stakeholders.
- 7.3 The NBN will also provide critical enabling infrastructure for innovative practices and products to be developed in Australia which impact all industry sectors. This will generate new opportunities for industry to develop high-bandwidth applications that could both improve both the productivity and the quality of life of Australians, and potentially be exported to the world.

### **ICT investment, innovation, R&D and productivity improvement**

- 7.4 The importance of innovation to Australia's productivity, global competitiveness and long term economic growth has been well-recognised. This was highlighted, for example, in the Federal Government's 2009 innovation agenda, *Powering Ideas*:

Innovation is the key to making Australia more productive and more competitive. It is the key to answering the challenge of climate change, the challenge of national security, the age-old

challenges of disease and want. It is the key to creating a future that is better than the past.<sup>1</sup>

7.5 Mr John Grant, Chair of the Information Technology Industry Innovation Council (ITIIC), told the Committee:

... we are operating in a global context and our success or otherwise will depend on how competitive we are globally, and how competitive we are is determined by how productive we are. How productive we are is determined by how innovative we are ...<sup>2</sup>

7.6 Mr Grant added that Australia's innovation performance and resulting productivity growth has been weak in recent years.<sup>3</sup> Australia ranked 21<sup>st</sup> in the world for innovation on the most recent 'Global Innovation Index' produced by INSEAD, well behind many other high income countries including Singapore, the United States, the United Kingdom and New Zealand.<sup>4</sup> Mr Grant largely blamed this on the relatively low level of R&D spending in the Australian economy:

If you believe research and development fuels innovation, which subsequently fuels productivity, which subsequently fuels competitiveness, R&D as a percentage of GDP in Australia is 1.7 per cent, which is 16th of OECD nations. In product innovation in large firms, we are 20th of OECD nations ... The fact is that statistically we do not sit strongly today to position ourselves as a competitive nation.<sup>5</sup>

7.7 The link between Australia's relatively low level of R&D investment and the impact on the nation's competitiveness was noted by a number of other inquiry participants. For example, the Australian Information Industry Association (AIIA) submitted that:

Australia spends some 2.01% of GDP on research and development (R&D) compared to the OECD average of 2.26% ... By any measure, Australia is lagging behind the key developed economies against whom we benchmark ourselves'.<sup>6</sup>

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1 Commonwealth of Australia, *Powering Ideas: An Innovation Agenda for the 21<sup>st</sup> Century*, 2009, p. 1.

2 *Committee Hansard*, Brisbane, 18 April 2011, p. 26.

3 *Committee Hansard*, Brisbane, 18 April 2011, p. 27.

4 Soumitra Dutta, INSEAD, *The Global Innovation Index 2011: Accelerating Growth and Development*, 2011, p. xviii.

5 *Committee Hansard*, Brisbane, 18 April 2011, p. 27.

6 AIIA, *Submission 184*, p. 21.



7.8 Optus put forward a similar view:

The current lack of private ICT investment in R&D has been well documented. Many large global ICT multinational corporations have closed down or moved their R&D operations outside Australia. Investment in public sector R&D has been similarly difficult to secure ...

A competitive R&D sector will see accelerated innovation.<sup>7</sup>

7.9 While it is clear that there is not a single factor that will alone turn around this performance, the Committee was provided with a wide range of evidence indicating that investments in ICT infrastructure, in particular broadband, have the ability to significantly contribute to improving innovation and productivity.

7.10 A recent report to the Australian Industry Group (Ai Group) by the industry-based Innovation Review Steering Group involved over 400 Australian firms in a detailed collaborative study aimed at finding ways to strengthen Australian innovation.<sup>8</sup> According to the report, the industry participants identified broadband as one of the most important contributors to the nation's innovative capacity:

The technologies viewed as most promising by firms for creating future innovation opportunities are fast broadband and software applications ...

The rollout of a very high speed national broadband network provides an unprecedented opportunity for Australian businesses to transform their innovation practice, in terms of realising cost-savings, productivity, extending market reach and introducing brand new types of products and services ...

... irrespective of the detail of broadband deployment and the particular technologies used, the prospect of ubiquitous connectivity, across both businesses and households, represents a real opportunity to achieve a step-change in Australian innovation.<sup>9</sup>

7.11 Dr Ian Oppermann, Director of the CSIRO ICT Centre, told the Committee:

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7 Optus, *Submission 179*, p. 11.

8 Report to the Australian Industry Group (Ai Group) by the Innovation Review Steering Group, *Innovation: New Thinking New Directions*, October 2010.

9 Report to the Australian Industry Group (Ai Group) by the Innovation Review Steering Group, *Innovation: New Thinking New Directions*, October 2010, pp. 6-8.

Almost all sectors of the Australian economy are underpinned by information and communications technologies. Innovative ICT research provides opportunities for improving productivity and transforming industries. It is likely that high-speed broadband will offer a transformation in communications on a scale similar to that which followed the introduction of the electricity grid and railway networks in Australia, creating new business opportunities of considerable economic value.<sup>10</sup>

- 7.12 The Australian Computer Society (ACS) described the NBN's ability to promote innovation as being obvious:

With respect to ICT stakeholders this view is a 'no brainer' – the NBN is a 'game changer' and in implementing the NBN, Australia will lead the world in innovation and drastically improve national productivity.<sup>11</sup>

- 7.13 The ITIIC explained in its submission that:

... underpinning innovation is the development and application of the appropriate skills; the appropriate legislative, policy and incentive settings; and the *infrastructure* of the digital economy – ubiquitous, high speed, high capacity, broadband communications.<sup>12</sup>

- 7.14 Similarly, the AIIA's submission stated that a high-speed fibre network offers a unique opportunity for a resurgence in R&D and innovation and was essential to Australia's future economic growth and competitiveness:

... the NBN infrastructure provides the platform for technology innovation using high performance computing capabilities – essential for virtually all modern day, sophisticated research activities. As we transition to a more advanced, complex knowledge society, access to information is not enough. Increasingly the ability to filter, manipulate, retrieve, model and share information in real time is the norm – not the exception. If Australia is to compete effectively in the international R&D environment, we must have the capability to handle, filter and make sense of large, complex volumes of data. Only a high speed fibre broadband network provides this – reliably and with the

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10 *Committee Hansard*, Canberra, 4 March 2011, p. 69.

11 Australian Computer Society (ACS), *Submission 146*, p. 6.

12 ITIIC, *Submission 111*, p. 1.

ability to scale as research activities become increasingly data and knowledge intensive.<sup>13</sup>

## Attracting foreign ICT investment in Australia

7.15 In its submission to the inquiry, the Department of Broadband, Communications and the Digital Economy (DBCDE) pointed to the following characteristics of the NBN that will help to drive research-based innovation in Australia:

- Capacity for both high-speed download and upload services, which enable collaborative research both locally and overseas;
- Ubiquitous coverage, which both lowers the costs of innovation and increases the size of potential markets for new products and services; and
- Highly stable and reliable connectivity, which provides a suitable platform for research and innovation.<sup>14</sup>

7.16 One result of these network characteristics is expected to be an improvement in Australia's global competitiveness as a destination for private sector investment in ICT research. DBCDE noted that the 'roll out of the NBN may attract international and domestic companies to invest in research and development that promotes and expands Australia's innovative capacity'.<sup>15</sup>

7.17 Optus made similar comments:

Optus believes with the right incentives Australia has the potential to attract back many of the large multinational ICT innovation centres. Important incentives such as the NBN and attractive tax structures would encourage larger and small businesses to invest in innovation.<sup>16</sup>

7.18 Several submissions mentioned the positive impact that the government's commitment to the NBN has already had in encouraging IBM to set up a Global Research and Development Laboratory in Australia.<sup>17</sup> The

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13 AIIA, *Submission 184*, p. 21.

14 DBCDE, *Submission 215*, p. 75.

15 DBCDE, *Submission 215*, pp. 75–76.

16 Optus, *Submission 179*, p. 11.

17 AIIA, *Submission 184*, pp. 21–22; ITIIC, *Submission 111*, p. 10; Department of Innovation, Industry, Science and Research (DIISR), *Submission 219*, pp. 41–42.

laboratory, based in Melbourne, is the largest investment in Australia in IBM's history and is undertaking research aligned with Australia's national research priorities. In launching the laboratory, then IBM Managing Director, Mr Glen Boreham, stated that '... delivering these types of real solutions is without question further enhanced by Australia rolling out a ubiquitous, high speed broadband network'.<sup>18</sup>

- 7.19 The local division of the large China-based telecommunications company, Huawei, told the committee that it has already begun to increase its ICT investments in Australia, with agreements now in place with RMIT University and the University of Melbourne for the supply of equipment and training to support local ICT research and skills development. Huawei stated:

Even though the National Broadband Network is just seeing its first connections being made today, Australia is already experiencing a boost to its R&D capabilities. Thanks to the world-leading nature of the project, it has gained international attention from the world's largest technology companies – with Huawei taking the lead in partnering with Australia's R&D community.<sup>19</sup>

- 7.20 Finally, several witnesses and submitters told the Committee that the NBN will support Australia's bid to host the \$2.5 billion Square Kilometre Array (SKA) radioastronomy project, both in terms of providing supporting infrastructure and providing enhanced capacity for public engagement.<sup>20</sup> Refer to Box 7.1 for information about the SKA.

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18 IBM, 'New IBM R&D Lab to Open in Australia', *Press Release*, 14 October 2010.

19 Huawei Australia, *Submission 105*, p. 12.

20 DIISR, *Submission 219*, pp. 37–38; Professor Steven Tingay, Deputy Director, International Centre for Radio Astronomy Research (ICRAR), *Committee Hansard*, Perth, 5 May 2011, pp. 11–17; Mr Paul Nicholls, Director, Strategic Projects, Office of Research and Development, Curtin University, *Committee Hansard*, Perth, 5 May 2011, pp. 18–27.

**Box 7.1 The Square Kilometre Array (SKA)**

Professor Steven Tingay of the International Centre for Radio Astronomy Research told the Committee that the €1.5 billion\* Square Kilometre Array (SKA) will be the most powerful instrument for astronomy ever built. It will have ability to study the evolution of the Universe, from the present day to the origin of the Universe soon after the Big Bang, over 13 billion years ago, addressing fundamental unsolved questions in physics.

Australia and New Zealand are bidding as a consortium to host the SKA, competing with Southern Africa for this opportunity. An international site selection process will come to a decision in 2012.

One of the infrastructure challenges of the SKA project will be in providing for the ability to transfer the 'massive volumes' of data produced by the SKA using long haul fibre networks. The SKA will consist of around 3000 radio antennas spread across remote parts of Australia, with each requiring 'something in the order of a couple of hundred gigabits per second' of bandwidth.

Professor Tingay noted that while the SKA's capacity requirements 'go well beyond' the capacity that the NBN alone will provide, the Perth to Geraldton route of the Regional Backbone Blackspots Program (RBBP) has already demonstrated that the NBN can play 'a crucial role' in enabling collaboratively developed fibre solutions that support the SKA. With collaboration between CSIRO, AARNet and the Government, the RBBP link to Geraldton was built with enough capacity to enable up to 8 terabits per second of accumulated bandwidth.

Professor Tingay noted that the potential for this model to be repeated along other NBN fibre routes across Australia 'is quite a strong selling point for Australian and New Zealand to win the SKA bid'.

Source: ICRAR, *Submission 228; Committee Hansard*, Perth, 5 May 2011.

\* approximately AUD \$2.1 billion as at 11 August 2011.

## Research in more locations and improved collaboration

- 7.21 The NBN will benefit research and innovation by extending the reach of high capacity networks beyond the large public research institutions, which already have access to a high bandwidth network through AARNet, Australia's National Research and Education Network (NREN). AARNet Pty Ltd is owned by the 38 universities and CSIRO. It provides specialised services to the research and education sector, with capacities

beyond those available from commercial carriers. A number of universities, schools and other research institutions told the Committee that they are already enjoying the benefits of high-speed broadband on their campuses with connections to AARNet of up to 10 Gbit/s, far beyond the initial speeds promised under the NBN.<sup>21</sup>

- 7.22 Dr Evan Arthur, Chair of the Australian Information and Communications Technology in Education Committee (AICTEC), told the Committee that the universities have benefited greatly from this high level of connectivity, and researchers were quickly able to utilise the capacity that AARNet provided:

When we first commenced that process and asked the university researchers what they would do and what kind of bandwidth they would need, the answers were quite modest. We made a decision to provide bandwidth which was well beyond what they had said they would need. The result of that has been that the vastly enhanced connection is now, in some cases, being used to its maximum and applications are being employed which were simply inconceivable before.<sup>22</sup>

- 7.23 AARNet Pty Ltd will shortly be upgrading its network to support connections of up to 100 Gbit/s.<sup>23</sup> AARNet told the Committee that its interests are complementary to the NBN, and that the benefit of the NBN is that it would extend AARNet's reach to smaller university sites as well as staff and student homes.<sup>24</sup> At a public hearing, Mr Chris Hancock, Chief Executive of AARNet, further explained that for those reasons AARNet intends to become a service provider of the NBN outside its core network:

We have applied ... to be an access seeker and we have been approved as one of those ... The reason we have done that is that we believe that, with collaborative research opening up across the community and given the time zones that Australia is in, with Europe and North America, we actually want to take a connection

21 La Trobe University, *Submission 48*, p. [3]; Australian Institute of Marine Science (AIMS), *Submission 60*, p. 2; University of Newcastle, *Submission 93*, p. 13; University of Sydney, *Submission 114*, p. [1]; University of Queensland, *Submission 153*, p. 4; CSIRO, *Submission 171*, p. 17; Monash University, *Submission 205*, pp. 204-05; Dr Jill Abell, Director of IT, The Hutchins School, *Committee Hansard*, Hobart, 11 March 2011, p. 42; Professor Ian Atkinson, Director, eResearch Centre, James Cook University, *Committee Hansard*, Townsville, 19 April 2011, p. 2; Professor Gerard Sutton, Vice-Chancellor, University of Wollongong, *Committee Hansard*, Wollongong, 28 April 2011, p. 7.

22 *Committee Hansard*, Canberra, 4 March 2011, p. 56.

23 AARNet, 'AARNet terabit ready with Cisco', *Media Release*, 28 June 2011.

24 AARNet, *Submission 46*, p. 1.

to the home from, for example, UNE in Armidale to a climate change researcher's home, so they can be doing their collaborative work at night over an AARNet connection via the NBN, taking that wholesale service.<sup>25</sup>

7.24 Other submitters and witnesses also told the Committee about the NBN's potential to extend research outside the large campuses. For example, Intersect Australia Ltd, an eResearch consortium consisting mainly of NSW universities, submitted that:

The NBN would provide an important and substantial functional extension to AARNet, allowing connectivity to smaller but important research sites, facilitating broadband access to non-university research partners, and allowing research staff and students to access the research infrastructure from wherever they are. Achieving this level of connectivity would (a) maximise the return on the existing investments made in research infrastructure, and (b) maximise the competitive advantage of Australian research on a world scale.<sup>26</sup>

7.25 The Committee notes with interest the view of the Department of Innovation, Industry, Science and Research (DIISR) and National ICT Australia (NICTA) with regard to the extension of research beyond the AARNet network. DIISR told the Committee:

Research is no longer traditionally happening just in labs; it is happening everywhere. People are in the field, people are in their homes, people want to access huge data sets from institutions that are not universities and therefore are not connected to AARNet. So we see the opportunities of that broader connection for the research sector as being absolutely enormous. We see already the requirements that people might have for access to data sets in, for example, state government departments and in field stations in relatively remote areas. We can see already that this will enhance the capacity for them to undertake that research significantly.<sup>27</sup>

7.26 NICTA noted that the NBN would provide the following benefits beyond those provided by AARNet:

- Connecting smaller, outlying research sites;

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25 *Committee Hansard*, Canberra, 27 May 2011, p. 29.

26 *Intersect Australia, Submission 89*, p. 2.

27 Ms Anne-Marie Lansdown, Head of Science and Infrastructure Division, DIISR, *Committee Hansard*, Canberra, 4 March 2011, p. 97.

- Connecting staff and students to high speed services from their homes, enabling researchers to be ‘as productive at home as they are at work’;
- Potentially providing ‘backbone’ capacity in areas not currently served by the AARNet backbone; and
- Proving more options for connecting K-12 institutions that are not currently connected with fibre.<sup>28</sup>

7.27 NICTA further submitted that:

As digital technology lowers the cost base, innovation can move to smaller companies or even to private homes as the consumer becomes an innovation co-inventor. The NBN will bring richer digital tools to consumer and small business and make it easier to collaborate with others in an innovation ecosystem and provide a more powerful platform to share the results. This kind of effect is already being seen in the media industry where graphic designers, musicians, video-producers and visual effects artists can now run their micro-SMEs from home.<sup>29</sup>

## Research in remote locations

7.28 A number of witnesses and submitters told the Committee about the capacity of the NBN to enable data-intensive research, particularly environmental research, to take place in a wider range of locations. Chapter 5 on infrastructure and the environment includes some discussion of the possibilities for enhanced environmental monitoring and resource management under the NBN. This section refers to more explicit implications for research, including the benefits of satellite broadband in the production of high quality data for analysis. As noted in Chapter 5, the application of remote sensors in environmental monitoring is increasing in prevalence, and the importance of connectivity between researchers working on collaborative projects should not be underestimated. CSIRO notes that:

... sensor networks have been deployed in remote locations, with the data traffic generated per sensor varying from a few bytes to gigabytes. Broadband networks will enable the transfer of data from the sensors back to laboratories.<sup>30</sup>

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28 NICTA, *Submission 198*, p. 29.

29 NICTA, *Submission 198*, p. 29.

30 CSIRO, *Submission 171*, p. 17.



7.29 The Australian Institute of Marine Science (AIMS), a publically funded research agency that carries out marine science across northern Australia, told the Committee that it currently depends on expensive mobile and satellite services to support its remote monitoring stations. AIMS submitted that the improved capacity and affordability of the NBN, particularly in satellite broadband, will have a significant impact on their work:

For very remote locations, such as outer reefs, we only have very limited access to expensive and slow satellite communications and this is true for much of Northern Australia. Access to high speed cost-effective internet would dramatically change how we can work in these areas and open up entirely new studies and science outcomes from these regions.<sup>31</sup>

7.30 The Committee heard that the NBN's satellite component provides exciting new possibilities for research and innovation. Thales Group, the world's largest producer of commercial spacecraft, argued that satellite is the most effective technology for remote scientific monitoring:

Where scientific measurement or monitoring requires long term data collection using remote equipment stations, satellite broadband coverage is the most effective solution. Instruments that measure a broad range of geological and atmospheric conditions are increasingly vital components in our ability to monitor and understand our environment. Remote instruments connected to a satellite broadband system can meet higher demands for data and real time manipulation by remote control.<sup>32</sup>

7.31 Professor Ian Atkinson, Director of the eResearch Centre at James Cook University (JCU), explained how satellite services provided by the NBN would enable research in the Daintree Rainforest to be undertaken far more effectively. Professor Atkinson discussed plans for JCU to introduce a research station at the university's 'canopy crane' in the rainforest. The crane 'can go across the canopy and sample the rainforest at various depths and locations', and the university intends to place sensors there that are capable of sending real-time information back to researchers:

It turns out that those scientists need very high resolution information. They need information around the microclimates, not just one square kilometre; they want to know the microclimate variations up a tree so that they can understand animal habitats in

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31 AIMS, *Submission 60*, p. [i].

32 Thales Group, *Submission 109*, p. A-4.

a very detailed and fine way. They want to be able to do that so that they can understand how the rainforest will respond to changes in climate, how its carbon balance changes, how those animal populations change.

To actually get communications into that area is quite diabolical. For us to get any sort of communications into the deep rainforest, mobile phone coverage just does not exist at the moment. With the satellite systems we think that we can really be stepping forward not just one or two steps, but 10 or 11 steps ... It is going to take a long time and other sorts of development, but it is the ability to communicate in real-time that unlocks that potential for them.<sup>33</sup>

- 7.32 The Space Industry Innovation Council also advised the Committee about the broad potential for scientific innovation enabled by the satellite component of the NBN:

The NBN satellites will be state of the art, and could well generate new products, services, processes and therefore new jobs in Australia as this highly performing communications capability is brought online.<sup>34</sup>

- 7.33 Additionally, the Space Industry Association of Australia (SIAA) submitted that there may be other opportunities beyond just faster broadband made possible from the launch of NBN satellites, in respect to additional monitoring equipment being attached to the satellites:

... the SIAA notes the in principle prospects of placing smaller secondary or 'hosted' payloads on the NBN satellites. These payloads might include devices which assist with precision navigation and sensors which monitor green house gases and other atmospheric and solar phenomena ... the SIAA commends the NBN Co and Government to consider the opportunity of fitting hosted payloads to future NBN satellites ...<sup>35</sup>

## Research collaboration

- 7.34 Professor Craig Bonnington, Director of the Monash E-Research Centre, told the Committee that although Monash University enjoys a 10 Gbit/s connection at its main campus, due to a lack of more ubiquitous connectivity its researchers are unable to collaborate online as effectively

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33 *Committee Hansard*, Townsville, 19 April 2011, p. 9.

34 Space Industry Innovation Council, *Submission 73*, p. 3.

35 SIAA, *Submission 94*, p. [1].

with colleagues in Australia as they are with international counterparts.<sup>36</sup> Professor Adam Shoemaker, Deputy Vice-Chancellor of Education at Monash, elaborated:

It is fair to say that while we are in a 'privileged island' position ... the communities immediately outside our campus are completely off the island. That is really the problem.<sup>37</sup>

7.35 The Committee accepts the view expressed in Monash University's submission that issues such as 'climate change modelling, population distribution and green energy solutions are extremely data centric' and that access to a high speed affordable data network is needed for 'the free flow of information and research data between universities, research institutes, business, industry and the community as a whole'.<sup>38</sup> This concern about the ability to collaborate was echoed by other universities and research institutions around Australia who recognised the NBN's potential to enable improved linkages to industry partners, community groups, remote sites and other research collaborators.<sup>39</sup> For example, the University of Sydney submitted that:

Providing the vast majority of Australian homes, schools and businesses with an optical fibre connection to a national network, will mean that high speed broadband connectivity will no longer be limited to a relatively small number of public and private sector organisations ... As a result, we expect that the capacity for collaboration in teaching, training and research between employers, schools, vocational education providers, universities and other organisations will be enhanced greatly.<sup>40</sup>

7.36 AIMS suggested that issues around equity of access to communications services will potentially be addressed by the NBN. AIMS noted that many of its remote and regional stakeholders are currently 'excluded from opportunities that affordable high speed communications enables'.<sup>41</sup> The

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36 *Committee Hansard*, Melbourne, 18 March 2011, p. 26.

37 *Committee Hansard*, Melbourne, 18 March 2011, p. 26.

38 Monash University, *Submission 205*, pp. 18–19.

39 La Trobe University, *Submission 48*, p. [3]; Australian Institute of Marine Science (AIMS), *Submission 60*, p. [i]; University of Newcastle, *Submission 93*, p. 13; University of Sydney, *Submission 114*, p. [1]; University of Technology Sydney, *Submission 200*, p. 1; Monash University, *Submission 205*, pp. 16–19; Professor Nicholas Glasgow, Dean, Medicine and Health Sciences, Australian National University (ANU), *Committee Hansard*, Canberra, 4 March 2011, pp. 83–84; Professor Ian Atkinson, Director, eResearch Centre, James Cook University, *Committee Hansard*, Townsville, 19 April 2011, p. 2.

40 University of Sydney, *Submission 114*, p. [1].

41 AIMS, *Submission 60*, p. [i].

potential for the NBN to enable improved research collaboration is particularly significant because a lack of collaboration is widely recognised as an area of weakness in Australia's research performance. The AIIA submitted that:

Australia ranks last in the OECD on collaboration for innovation between business and higher education institutions. This is notwithstanding that collaboration is regarded as one of the single most important contributors to innovation development ...<sup>42</sup>

7.37 Similarly, Professor Doan Hoang of the University of Technology, Sydney, told the Committee:

The recent Excellence in Research for Australia (ERA) initiative has affirmed that on the whole the research quality of Australian institutions are above the international benchmark, however, research collaboration amongst them and with international partners is insignificant.<sup>43</sup>

7.38 Professor Hoang continued to explain that the current lack of collaboration is partly due to funding models and partly due to a lack of facilitating infrastructure. According to Professor Hoang, the NBN would overcome the latter problem by providing a platform for high-bandwidth interaction and data transfer between collaborators:

With the NBN, the distance barrier between institutes/organisations is no longer an issue as the network performance provides adequate bandwidth for just-in-time collaborative environments and fast response times for real-time interaction at minimal costs to the institutions (compared to the current situation). Furthermore, the NBN provides abundant bandwidth to support the transfer of the massive amount of data often required ...<sup>44</sup>

7.39 In his presentation to the Committee, Professor Bonnington of Monash University stressed the importance of data-based collaboration, suggesting it is a more important component of research collaboration than person-to-person interaction:

Videoconferencing is good, but it has been designed for the sort of environment where we want to talk to somebody. True research collaboration is actually about collaborating around the data. You

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42 AIIA, *Submission 184*, p. 22.

43 Prof. Doan B. Hoang, *Submission 177*, p. 4.

44 Prof. Doan B. Hoang, *Submission 177*, p. 4.

cannot actually represent that data through a video linkage very well – in fact, it works very poorly ... However, if you can push it through in other forms, and even develop new technology that will go beyond what is available, you are able to get new forms of collaboration happening.<sup>45</sup>

- 7.40 By way of example, Monash told the Committee in its submission about the Australian National Data Service (ANDS), a government-funded eResearch facility that provides a central repository of data collections available to be used by research teams around the country. ANDS seeks to ‘create the infrastructure to enable Australian researchers to easily publish, discover, access and use research data’.<sup>46</sup> Monash told the Committee that the benefits of ANDS could increase significantly if bandwidth is made more widely available, and the facility could even be used by schools for education purposes:

For society to obtain the maximum benefit from these facilities, it is vital that they be utilised by as many researchers as possible both within and beyond university circles ... Making greater bandwidth available to other educational sectors is critical to opening up opportunities of this type.<sup>47</sup>

- 7.41 NICTA submitted that the NBN’s capacity to promote sharing and manipulation of data outside the public sector research networks could have a major positive effect on the formation of research partnerships and the participation of private industry:

By upgrading broadband access to every premise[s], the private sector will begin to have access to the kinds of broadband performance and digital tools currently available largely to the public sector innovation system. When connected, smaller private organisations engaged in research could have affordable access to massive public sector computational research clouds. This may encourage better operation of ecosystems which mix the public and private sectors, most notably the ARC Cooperative Research Centres and Industry Linkages programs.<sup>48</sup>

- 7.42 Cooperative Research Centres (CRCs) provide particularly good examples of the type of research models that could flourish under the NBN. CRCs are ‘large, multi-participant collaborative organisations which operate

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45 *Committee Hansard*, Melbourne, 18 March 2011, p. 26.

46 Monash University, *Submission 205*, pp. 16–17.

47 Monash University, *Submission 205*, p. 17.

48 NICTA, *Submission 198*, p. 29.

from multiple sites or nodes across Australia'. The CRC Committee, which provides advice to the government on CRC funding and operational management, told the Committee that collaboration between CRC participants would be enhanced by the NBN:

CRC participants (research organisations and end-users) are geographically dispersed. The NBN will generate efficiencies by making it possible to use high definition, two-way real time video, opening up a new dimension in terms of video meetings and the ability to concurrently work on data. In addition, many CRC participants are international organisations and, to participate economically and effectively in a CRC, need to be able to access and interact with their CRC partners electronically. The NBN will facilitate greater involvement of overseas participants.<sup>49</sup>

- 7.43 RMIT University also told the Committee about the potential for the NBN to improve collaboration internationally, not just locally. Their submission suggests that if the current limitations in connectivity can be overcome, similarly to the business community (as discussed in Chapter 6), Australia's research community could actually benefit from being in a time zone that is offset from North America and Europe:

Australia's geographical position has placed limitations on international collaboration with peers around the globe. Multiple time zones can enable international research teams to work on a problem around the clock. However, limited communications have made it difficult to share large data sets, to discuss technical problems and areas of contention in a timely manner. NBN infrastructure has the potential to resolve this limitation for collaboration with other NBN-enabled countries, giving Australian researchers a stronger position in global research.<sup>50</sup>

## Increased public engagement in science

- 7.44 An extension of the NBN's capacity to extend the reach of research collaboration to more people is its ability to facilitate a higher level of engagement of ordinary people in science and research projects.
- 7.45 The Government of South Australia told the Committee about the Royal Institution of Australia (RiAus), a science-outreach organisation based in Adelaide. RiAus has a focus on promoting public awareness and

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49 Cooperative Research Centres (CRC) Committee, *Submission 196*, p. 2.

50 RMIT University, *Submission 180*, p. 4.

understanding of science by ‘bringing science to people and people to science’. Its media-rich website, which includes streamed videos of its programs and lectures for those who cannot attend in person, is expected to become more widely accessible when the NBN is rolled out:

Video content such as that at RiAusOnDemand can only be accessed with a fast internet connection. The NBN will ensure that such opportunities to engage with Australian science are available in population centres domestically, even overseas, as well as in more remote Australian communities.<sup>51</sup>

- 7.46 Questacon, Australia’s National Science and Technology Centre, is also largely focussed on engaging students and other members of the public in science using online services, made possible through their fibre connectivity. Mr Graham Smith, General Manager of Development at Questacon, told the Committee about some of Questacon’s recent activities in online science engagement using video-conferencing technologies:

We are on AARNet, so we have been able to make use of that capability to reach a lot of schools. We have been using it for about 18 months, and trialling a variety of different formats. What we are able to do now is link institutions such as CERN [the European Organization for Nuclear Research], for instance, into schools. We have linked up with Japanese research groups and taken, in a virtual sense, schools so that they can do live interactive Q&As with international and Australian institutions. It is quite remarkable, mainly because of the speed and the lack of delay.<sup>52</sup>

- 7.47 The Committee notes the extensive benefits accruing to Australian students and teachers from such linkages with scientists in world-leading research facilities, in multiple disciplines and locations. Apart from Mr Smith’s reference to CERN, where the Large Hadron Collider is located, the Committee heard that Questacon links online to Arctic and Antarctic scientists participating in the global Polar Palooza event in Canberra and in the field in Antarctica; and Cooperative Research Centres in the field of robotics.<sup>53</sup>

- 7.48 Mr Paul Nicholls, Director of Strategic Projects, Office of Research and Development at Curtin University, told the Committee that if Australia is successful in its bid to host the SKA, ordinary people with an NBN

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51 Government of South Australia, *Submission 195*, p. 12.

52 *Committee Hansard*, Canberra, 4 March 2011, p. 95.

53 DIISR, *Submission 219*, p. 38.

connection will be able to participate in research related to the project through the 'Skynet' program.<sup>54</sup> See Box 7.2 for more information.

**Box 7.2 Skynet**

'Skynet' is a citizens' science program that will enable members of the public to use their personal computers, with fast broadband connections, to help process radio astronomy data generated by the Square Kilometre Array (SKA). Not only would this assist professional SKA researchers with their work, it could also have significant benefits for increasing the level of interest of students in pursuing future science careers.

Mr Paul Nicholls of Curtin University explained that Skynet is 'about motivating students and teachers and helping them to participate in the broader science field'. He added that 'having teachers that can provide context for students is really important: this is a real project that is really happening'.

Source: *Committee Hansard*, Perth, 5 May 2011.

7.49 A major long term benefit of this type of public engagement in science is that it can provide motivation for young people to become involved in maths and science careers, thereby increasing Australia's long term capacity to undertake leading-edge research. Monash University envisaged a scenario where Queensland rainfall data was available to schools via ANDS:

Students returning to school after a flood event could be led on a discovery process by their teachers examining historical and current rainfall data. A football-mad student could use real sports statistics as a pathway into understanding statistical problems generally. These immersive and real world experiences that allow students to pursue an area of current interest, or a long-held passion, may well be critical to forming their career path. For some of them, this might be the transformative moment that sets them on a career of research and discovery.<sup>55</sup>

54 *Committee Hansard*, Perth, 5 May 2011, p. 22.

55 Monash University, *Submission 205*, p. 17.



## Promoting application development

- 7.50 It is clear from the evidence noted above that the NBN has much to offer the world of research and innovation in terms of providing infrastructure that encourages R&D investment, equips researchers, and promotes better collaboration and public engagement. It is also clear that the NBN has the potential to promote innovation in a broad sense, increasing productivity across the economy as innovative new products and ways of doing things are employed. The types of specific applications that could be developed and utilised in Australia as a result of the NBN are discussed in detail throughout the other chapters of this report. However, the Committee heard from several inquiry participants that government support is required to underpin the development and utilisation of these broadband applications.
- 7.51 In terms of public sector R&D, there are a number of research institutions around Australia that are focused on developing innovative new applications based on broadband technologies, most of whom already receive significant government support. DBCDE advised the Committee that such institutions were taking pioneering roles in driving innovation ahead of broader industry sectors:
- For many potential users the benefits or value of the NBN is in the network effect. For example it is only when a critical mass of customers or clients is able to access the NBN that some firms will start to explore its potential. However the work of organisations such as CSIRO, NICTA and IBES make an important contribution to identifying and proving the ideas that innovative firms will capitalise on in the medium term as the NBN rollout gets more extensive.<sup>56</sup>
- 7.52 During the course of the inquiry, the Committee took the opportunity to visit one of these institutions, the Institute of a Broadband-Enabled Society (IBES). IBES is based at the University of Melbourne and receives additional funding from both the Victorian Government and from industry partners. It is focused on developing high-bandwidth solutions for a wide range of social and economic applications. For more information on IBES, refer to Box 7.3 below.

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56 DBCDE, *Submission 215*, p. 76.

**Box 7.3 The Institute for a Broadband-Enabled Society (IBES)**

IBES is a cross-disciplinary research institute dedicated to innovations in products, services and end-user experiences that maximise the benefits of new broadband technologies to Australian society. Research at the Institute focuses on a wide range of fields including education and learning, health and wellbeing, network deployment and economics, service and business transformation and social infrastructure and communities.

The Institute was founded in July 2009 and is jointly funded by the University of Melbourne and the Victorian State Government. The Society has stated that the NBN will shape the delivery of education, provision of health care, management of resources and connections with others.

Projects include Uni TV (see Box 4.4) which aims to deliver tertiary education services through a web-based portal; development of e-health applications, including youth mental health and wellbeing, tele-health and electronic health records; natural resource and environmental management through the use of sensor networks; and research into the community and social benefits of broadband uptake including social inclusion and social diversity, improved service delivery to urban, regional and remote communities, and the development of innovative applications which find new uses for Australia's cultural heritage, but that also facilitate new possibilities for user-led innovation.

Source: IBES, *Submission 84*.

- 7.53 In December 2010, an institution with a similar mandate to IBES, the Australian Centre for Broadband Innovation (ACBI), was launched in Sydney. ACBI was established by CSIRO in partnership with NICTA and the NSW Government. ACBI will 'develop and trial new applications and services for the NBN with a particular focus on regional service delivery'.<sup>57</sup> CSIRO and NICTA are also developing new high-bandwidth applications independently.
- 7.54 The Committee heard that there is further scope for investment in research and development of broadband applications for particular industry sectors and to address particular issues. While NBN-enabled applications for the agricultural sector are discussed more broadly in Chapter 6, the Committee notes at this point their particular relationship to R&D. The National Farmers Federation told the Committee that:

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57 DBCDE, *Submission 215*, p. 76.

Commercial and export opportunities may exist in the development of ... applications to improve the efficiency and productivity of Australian agriculture. Some work has been undertaken by the CSIRO ICT centre on the use of information technology in agriculture, including virtual fencing, bull separation, pasture management, water quality monitoring and agricultural robotics. However, significant further work is required; particularly research and development work in partnership with farmers.<sup>58</sup>

7.55 Mr Nicholls of Curtin University also told the Committee that more investment in application development will be required: 'the biggest issue in securing the potential is a lack of investment in development of quality content and quality research'.<sup>59</sup> In its submission, Curtin University expressed interest in contributing to an 'Australian National Broadband Strategic Research Facility', which would focus on providing content for the NBN to 'providing major city levels of service, especially those services delivered by Government, to all Australians'.<sup>60</sup>

7.56 With regards to the private sector, the Committee heard from some organisations that although fast, ubiquitous broadband would enable innovation to take place, the infrastructure of the NBN alone would not be enough to drive innovation to the maximum extent possible.

7.57 The Business Council of Australia (BCA) submitted that ICT 'was critical to Australia's improved productivity performance during the 1990s' and 'will continue to make an important contribution'.<sup>61</sup> However, BCA also noted that Australia's taxation system and regulatory frameworks are at least as important as infrastructure like the NBN in promoting productivity-enhancing ICT investments.<sup>62</sup> BCA wrote:

The first step in using ICT as an enabler for productivity growth should be to ensure that Australia's taxation system and regulatory framework adequately support ICT innovation and investment. The regulatory framework encompasses not just regulations but the wide range of government settings that affect the incentives of firms, such as funding arrangements, supply quotas and price caps.<sup>63</sup>

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58 National Farmers' Federation, *Submission 197*, p. [4].

59 *Committee Hansard*, Perth, 5 May 2011, p. 20.

60 Curtin University, *Submission 91*, p. [2].

61 Business Council of Australia (BCA), *Submission 207*, p. 5.

62 BCA, *Submission 207*, pp. 8-9.

63 BCA, *Submission 207*, p. 9.

7.58 Scientific Applications International Corporation (SAIC), a large US-based scientific, engineering and technology company, cautioned that the NBN's large potential to be a 'platform for innovation' would only be maximised if the Government acts to focus application development on 'forging new partnerships between industry, universities, and national laboratories'.<sup>64</sup> SAIC explained:

While we believe that Australian government R&D and university institutions are positioned to advance the state-of-the-art in many aspects that touch on the NBN, we have taken a position ... that the opportunity exists to exercise a new R&D investment paradigm when it comes to the NBN. The R&D investment for the NBN could involve industry and the extending competition for R&D funds on an equal footing between government labs, universities, and industry (small and large) could greatly enhance the outcomes of the investments. The government should encourage collaboration among these institutions, and commercialisation should be emphasised in order to turn these investment dollars into enduring Australian jobs.

The government could also consider an R&D framework that allows private funding to augment public investment ...<sup>65</sup>

7.59 Optus submitted that in addition to government support for development of broadband applications, 'further assistance for commercialisation of NBN services and applications will help see these ideas through to market'.<sup>66</sup>

7.60 The ITIIC told the Committee that if businesses can lift their level of innovation by leveraging the NBN, there is a 'considerable opportunity for the local IT industry' to develop high-bandwidth software applications. These applications could be exported to the world, shifting the balance away from Australia's traditional status as being 'great users but not producers of ICT'.<sup>67</sup>

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64 Scientific Applications International Corporation (SAIC), *Submission 35*, p. 2.

65 Scientific Applications International Corporation (SAIC), *Submission 35*, p. 6.

66 Optus, *Submission 179*, p. 11.

67 ITIIC, *Submission 111*, p. 6.

## Committee conclusions

- 7.61 The Committee received convincing evidence that the NBN will provide a critical enabling platform for improving Australia's R&D and innovation performance.
- 7.62 As a world class, high speed and ubiquitous network, the NBN will provide incentives for foreign companies to set up research and development facilities in Australia. These investments are already becoming apparent, with IBM recently launching a Global Research and Development Laboratory in Australia. The Square Kilometre Array project will represent a major investment in Australia's research capabilities, should Australia's bid be successful.
- 7.63 The NBN will also provide opportunities to improve the way research and development is undertaken in Australia. The ubiquity of the network will enable research to be undertaken in places where it is currently limited by geography and lack of connectivity. The NBN's satellite component, in particular, will enable a much higher quality environmental science to take place in remote areas. By extending high speed broadband outside the major research campuses, the NBN will enable vast improvements to the ability of researchers to collaborate with stakeholders in private industry and the broader community, a widely acknowledged area of weakness in Australia's current research activities. By connecting fibre to homes and schools, the NBN will also enable an increased level of engagement in science with the general public, which has the potential to improve the level of interest in high-demand science- and mathematics-based careers.
- 7.64 Furthermore, the NBN will provide Australia with the opportunity to lead the world in the development of applications that use high-speed broadband across all sectors of society, including business, education and environmental management. Such development could lead to improved export outcomes for Australia's ICT sector. According to the OECD, Australia's export of ICT products as a proportion of total merchandise exports is currently among the lowest in the world, at only 1.5 per cent, compared to 27 per cent in South Korea.<sup>68</sup> The NBN will be an important factor in driving a higher level of ICT exports.

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68 Australia's 'share of ICT goods in total merchandise exports' in 2008 was second lowest in the OECD, and decreased from 3.6 per cent in 1996 to 1.5 per cent in 2008. See *OECD Information Technology Outlook 2010*, pp. 90, 116.

- 7.65 For this potential to be realised, the Committee recognises there is a need for continued government support for organisations, such as IBES and ACBI, which are involved in developing applications to utilise the NBN.
- 7.66 The Committee also recognises that, provided appropriate regulatory structures are in place, the NBN has the potential to underpin resurgence in private sector R&D investment.
- 7.67 Given the high level of potential benefit to the research community that the NBN offers, particularly due to its ubiquitous coverage, the scientific community should be seen as an important stakeholder during the NBN's design and rollout. There is already a precedent for this: during the recent construction of the RBBP fibre link from Geraldton to Perth, CSIRO, AARNet and DBCDE co-operated to ensure that additional capacity was built into the fibre route to enable use by the SKA project. Other examples of where these types of mutually beneficial arrangements can be made could include allowing NBN satellites to carry additional 'hosted payloads' that would be able to increase scientific outcomes for little additional cost. The Government and NBN Co should recognise the potential value of their infrastructure to the research sector and maintain ongoing dialogue with representative research bodies to identify how the potential benefits can be maximised in the NBN's final design.

## Community and social

- 8.1 This report has already looked at the capacity of the NBN to facilitate social and community benefits in many different areas. For example, the NBN will enable improved access to health, education and other government services in regional areas and contribute to more economically and environmentally sustainable communities.
- 8.2 This chapter will examine some other social and community aspects, namely, the capacity of the NBN to:
- contribute to improved levels of social inclusion and social interaction;
  - enable new methods of community interaction;
  - promote more flexible working arrangements and improved work-life balance;
  - enable new ways of participating in recreational and cultural activities; and
  - facilitate better access to information and digital media.
- 8.3 This chapter will also briefly examine risks and opportunities presented by the NBN in regards to safety and criminal activities.

### **Improving social inclusion and interaction**

- 8.4 The term 'digital divide' is frequently used to describe the current state of telecommunications in Australia. The divide is between those who are able to take full advantage of the opportunities offered by technologies such as broadband internet and those who are not. The Department of Human Services (DHS) defines the digital divide as 'the imbalance in both

physical access to technology and the resources and skills needed to accrue benefits from use'.<sup>1</sup>

8.5 The Committee is aware that many social factors may impact on the extent of the digital divide. According to the Australian Bureau of Statistics (ABS), 26 per cent of Australians aged 15 years and over did not access the internet in 2008-09. This rate was significantly higher for people on low incomes, those aged over 55, the unemployed, Aboriginal and Torres Strait Islanders, those from non-English backgrounds, those who did not complete Year 12, and those living in regional and remote areas of Australia.<sup>2</sup>

8.6 Where previous sections of this report have focused on the capacity of the NBN to improve access to health, education and employment services, this section will examine the NBN's capacity to enable greater levels of social inclusion and interaction. Evidence received by the Committee indicated that overcoming the digital divide would go some way to improving the welfare of people who are currently isolated or disadvantaged.

8.7 The Australian Information Industry Association (AIIA) told the Committee that the internet has a powerful role in overcoming social exclusion:

The history of the internet is evidence of the impact that better and more diverse access to information has on improving social capital.

We know from experience that online access to information and services plays a vital role in reducing social isolation and increasing social cohesion. The last 20 or so years of the internet is evidence of how disenfranchised and isolated individuals and communities have been reconnected through the internet and virtual communities of interest.<sup>3</sup>

8.8 Similarly, the Australian Communications Consumer Action Network (ACCAN) wrote that the NBN could have a significant impact in improving the lives of disadvantaged people:

We view the NBN as having the potential to open up new opportunities for the most disadvantaged people in our

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1 DHS, *Submission 186*, p. 9.

2 ABS, *Household Use of Information Technology Australia 2008-09*, 16 December 2009, pp. 35-36.

3 AIIA, *Submission 184*, p. 23.



community and to create a range of new educational and economic benefits as the effect of geographic isolation is reduced.<sup>4</sup>

- 8.9 Optus told the Committee that, beyond the intrinsic benefits, there are broader economic benefits to improving social inclusion and that the NBN could play a key role:

The social inclusion agenda recognises that there are significant dividends, both social and economic, from engaging the community more fully. Social inclusion improves our capacity to learn, work and engage. Social inclusion increases the number of skilled and able workers and can assist to reduce the number of disadvantaged communities. The availability of technology is a major contributor to social inclusion and the NBN's potential to re-engage and reinvigorate communities is significant.<sup>5</sup>

- 8.10 The Committee heard that the ubiquitous nature of the NBN was the key to the full range of benefits being realised for those most disadvantaged. The Department of Broadband, Communications and the Digital Economy (DBCDE) submitted:

Ubiquitous, reliable, high-speed broadband can contribute towards achieving greater social inclusion, deliver consumer welfare and social benefits, and lead to enhanced employment outcomes. Research suggests that exclusion from networks that reach almost all people has the potential to negatively affect those excluded.

The NBN's ubiquitous nature means that all Australian premises will be able to more readily access the internet if they so choose.<sup>6</sup>

- 8.11 Adult Learning Australia (ALA) similarly submitted that ubiquity, rather than speed alone, is the key to building social inclusion:

It is our experience that technology can greatly enhance the learning experience, and build social inclusion. We believe that these can be dramatically increased by the NBN, through the right policy approach, not just because of the NBN's speed, but more because of its ubiquitousness.<sup>7</sup>

- 8.12 Much of the evidence received by the Committee about social inclusion revolved around the NBN's capacity to increase social interaction between

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4 ACCAN, *Submission 128*, p. 3.

5 Optus, *Submission 179*, p. 12.

6 DBCDE, *Submission 215*, p. 81.

7 ALA, *Submission 163*, p. [1].

family and friends, particularly by enabling two-way video communication over distance. For example, Mr Brian Hales, Economic Development Advisor for the City of Onkaparinga, in South Australia, told the Committee:

It spans everything we do. How communities relate to each other and communicate with each other. We have a lot of single households, as a lot of regions do have, and loneliness is always a factor there. Anything we can do to reduce that is good. Connecting our communities via video would be great. They are connected by phone at the moment I suppose, but there is a greater amount of information they can send down the line.<sup>8</sup>

8.13 It should be acknowledged that online social interaction, including over video, is intended to supplement personal interaction, rather than be a substitute for person-to-person contact. Hobart City Council noted that the provision of digital infrastructure, exciting as it may be, can be utilised as a 'medium to value-add' to human contact, and does not have the capacity to replace it.<sup>9</sup>

8.14 In a report commissioned by Huawei, British researcher Dr Tim Williams found that ubiquitous fast broadband can have a major impact in improving community connectedness. However, he cautioned that building the network alone would not be enough:

The real challenge of broadband in Britain and Australia is not just to enable access. It is to ensure *use* by people and communities of all kinds. It is to see the objective as not just the building of a technical network but the creation of a 'networked society' with all the benefits of online participation for all which flow from it.<sup>10</sup>

8.15 Several inquiry participants also told the Committee that action will be needed to ensure the disadvantaged are able to reap the benefits of the NBN. If not, there is a risk of the NBN inadvertently extending the digital divide rather than overcoming it. For example, DHS submitted that:

... internet use can play an important role in facilitating social inclusion, particularly in the social, economic, political and cultural domains. However, this requires a concerted effort to

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8 *Committee Hansard*, Victor Harbor, 5 April 2011, p. 31.

9 Hobart City Council, *Submission 98*, p. [2].

10 Dr Tim Williams (Huawei), *Connecting Communities: The impact of broadband on communities in the UK and its implications for Australia*, February 2011, p. 18.

address issues beyond access, by helping people develop the skills, literacy and knowledge needed for effective online engagement.<sup>11</sup>

- 8.16 DHS also noted the need for careful monitoring to avoid future service offerings under the NBN widening the 'digital divide'. DHS identified increasing demand for sophisticated applications and content requiring faster connection speeds as a risk for driving 'technological solutions that will reduce accessibility for remote-area or disadvantaged customers'.<sup>12</sup>
- 8.17 These views were echoed by others, including the University of Newcastle, which noted that the community benefits that arise from the NBN should be available to all. The University observed that 'the NBN has the potential to exacerbate rather than remediate the digital divide,' and called for a concerted effort from all levels of government to ensure improved access levels for people from low socio economic backgrounds, older members of society, and the disabled and disadvantaged. The University noted that these groups will continue to be digitally excluded unless such efforts are made to ensure access.<sup>13</sup>
- 8.18 The remainder of this section will discuss the role of the NBN in promoting social inclusion with regard to the key groups noted in the above discussion, that are currently disadvantaged by the digital divide. The challenges and opportunities around overcoming the divide will be discussed briefly in the context of each group within this section, and then more broadly in Chapter 11.

## Australians in rural and remote areas

- 8.19 According to the Australian Bureau of Statistics (ABS), 34 per cent of people living in outer regional or remote areas did not access the internet in 2008–09, compared to 23 per cent of those living in major cities.<sup>14</sup>
- 8.20 Mr Mark Needham, member of the Regional Telecommunications Independent Review Committee (RTIRC) that reported to the Government in 2008, told the Committee that people in rural areas are often frustrated at the lack of services available to them and the inadequacy of the 'stopgap, second-rate, second-class' services that are made available. He also explained that a lack of telecommunications services has a significant impact on the psyche of Australians in remote areas:

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11 DHS, *Submission 186*, p. 11.

12 DHS, *Submission 186*, p. 11.

13 University of Newcastle, *Submission 93*, p. 15.

14 ABS, *Household Use of Information Technology Australia 2008–09*, 16 December 2009, p. 36.

From a social inclusion perspective ... people feel isolated. People feel they are not part of the whole. They cannot do the things they see some people supposedly doing on the television or they hear about. The effect of not having equitable services is that they do not feel part of the whole.<sup>15</sup>

- 8.21 The Committee heard that the NBN has the potential to redress these issues. Regional Development Australia (RDA) Yorke and Mid North (South Australia) told the Committee that by its extension to small towns, the NBN's greatest benefit will be 'the connection between communities and the reduction in isolation of individuals'. RDA Yorke and Mid North further noted that:

Improved access to broadband services in regional areas will allow youth to study, socialise, shop and keep pace with their generational counterparts in the city, watching the latest movies, listening to the latest music and playing the latest online games.<sup>16</sup>

- 8.22 Enabling increased social interaction between family and friends, regardless of distance, was identified as a key advantage of the NBN for rural and remote residents. The National Farmers' Federation told the Committee that the NBN could enable a range of new ways for rural Australians to interact:

The NBN is also likely to provide opportunities to link groups within the community across regional Australia and provide social services and support. Opportunities range from: connecting industry members (for example Dairy Australia's web forum); to providing mental health support to individuals (for example the e-headspace counselling service); to forums which connect and support individuals who may be isolated by circumstance or geography.<sup>17</sup>

- 8.23 Dr Anna Williamson, General Manager of Policy and Advocacy at the Leukaemia Foundation, informed the Committee that broadband-enabled communication technologies will particularly benefit sufferers of illness in rural areas, enabling them to interact in online forums with specialists and other sufferers of the same condition:

A lot of people with these disorders seldom meet someone with the same condition. If you are in rural or regional Australia, that is further compounded because there are fewer people there. It is

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15 *Committee Hansard*, Brisbane, 18 April 2011, p. 23.

16 RDA Yorke and Mid North, *Submission 121*, p. 13.

17 NFF, *Submission 197*, p. [4].

really important for patients on this journey to have peer support.  
... So it is really about improving access to information and also  
dealing with the tyranny of isolation and distance.<sup>18</sup>

- 8.24 Mr Robert Walker, Chief Executive Officer of AgForce Queensland, advised that by reducing social isolation the NBN could help address the high rates of mental health issues in regional areas:

There is also a very high proportion of mental illness in the bush and I think that has been borne out by recent floods. Due to the remoteness of some of these properties and isolation ... there is an inability for social interaction. We see this as a tool for producers to greater engage with their communities in a social scene. We hope that if they are able to do that the prevailing issues of mental health, mental illness and suicide in regional and rural Queensland can be diminished.<sup>19</sup>

- 8.25 The Committee also heard that the ability to maintain interaction with family and friends could be a factor in helping organisations in remote areas attract and retain staff. For example, Mr Paul Nicholls, Director of Strategic Projects in the Office of Research and Development at Curtin University, said that the NBN 'has the potential to improve the mental health of these employees in their current situations by building tele-presence suites and enabling them to engage in their children's education or just catching up with their wives or husbands'.<sup>20</sup> Similarly, NICTA explained that the NBN would particularly benefit regional areas as workers in knowledge-based industries would no longer need to be 'uprooted' from their local communities to move to the city.<sup>21</sup>

- 8.26 McKinlay Shire Council submitted that not only could fast broadband enable people in remote areas to connect better with family and friends, but that ubiquitous access to broadband is a matter of equity:

... the NBN will supply faster connections for residents wishing to communicate visually with family and friends, through media sources such as Skype. Although McKinlay Shire's physical location may place large distances between loved ones, the NBN will assist in eliminating this void. Irrespective of our remote location, residents of McKinlay Shire deserve equity of service.<sup>22</sup>

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18 *Committee Hansard*, Brisbane, 18 April 2011, p. 51.

19 *Committee Hansard*, Brisbane, 18 April 2011, p. 41.

20 *Committee Hansard*, Perth, 5 May 2011, p. 19.

21 NICTA, *Submission 198*, pp. 30–31.

22 McKinlay Shire Council, *Submission 31*, p. [3].

- 8.27 McKinlay Shire Council, along with other inquiry participants,<sup>23</sup> questioned the adequacy of the NBN's wireless and satellite services to deliver these outcomes for the residents of smaller communities. Issues of adequacy of services will be considered in more detail in Chapter 9 on network capacity and technology, and Chapter 11 on encouraging uptake.

## Indigenous Australians

- 8.28 Data from the ABS shows that 38 per cent of Indigenous Australians did not access the internet in 2008–09, compared to 26 per cent of other Australians.<sup>24</sup> A recent study undertaken in three remote Indigenous communities found that less than 6 per cent of participants had a computer, and 58 per cent had used a computer at some time in the past. Of this 58 per cent, one third had never used the internet.<sup>25</sup>
- 8.29 The Indigenous Remote Communications Association (ICRA) told the Committee that, although improved telephony services were a higher priority, access to broadband services could have a major social and economic impact on remote Indigenous communities:
- Access to broadband telecommunications can play a crucial role in overcoming inequities due to remoteness, and help to close the gap on access to health, education, training and employment opportunities and other basic services. It can provide important social outcomes in connecting up separated families and support the maintenance of Australia's unique Indigenous culture and languages. Broadband would reduce the vast digital divide for remote Indigenous populations and provide significant outcomes in terms of social, economic and cultural development and connect remote regions with the broader community.<sup>26</sup>
- 8.30 ICRA submitted that video-conferencing would be 'one of the most useful applications of broadband in remote areas'. It would enable benefits such as linking families with relatives who are away for extended periods;

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23 For example, Gloucester Shire Council, *Submission 6*; Wheatbelt East Regional Organisation of Councils, *Submission 40*; Get Connected, *Submission 43*; RDA Yorke and Mid-North, *Submission 121*, pp. 13–14; NFF, *Submission 197*; RDA Townsville and North West Queensland, *Submission 202*; NT Government, *Submission 209*; Mr Needham, RTIRC, *Committee Hansard*, Brisbane, 18 April 2011, pp. 14–25.

24 ABS, *Household Use of Information Technology Australia 2008–09*, 16 December 2009, p. 35.

25 ARC Centre of Excellence for Creative Industries and Innovation, the Centre for Appropriate Technology and the Central Land Council, *Home Internet for Remote Indigenous Communities*, 2011, p. 11.

26 IRCA, *Submission 82*, p. 5.

enhancing communication in Indigenous languages; facilitating regional meetings, including with groups; reducing costs and risks by reducing the need to travel; accessing services such as tele-health and education; reducing the need for travel to travel for court hearings and probation meetings; and reducing unnecessary incarceration.<sup>27</sup>

- 8.31 Other organisations also told the Committee that the NBN could help improve communication and services for their Indigenous residents. For example, the Eastern Regional Digital Corridor NSW submission, prepared by the Central Coast, Hunter, Mid North Coast and Northern Rivers RDAs, said that the NBN could enable governments to deliver substantially improved health and education services for the region's Indigenous population.<sup>28</sup> Kiama City Council submitted that the NBN could help them to develop improved methods of engaging with Indigenous residents who are reluctant to attend formal community meetings.<sup>29</sup>
- 8.32 Based on feedback from Indigenous people of Wilcannia and Menindee, RDA Far West NSW suggested in its submission that there are particular barriers to be overcome in order to enable its Indigenous residents to take advantage of the opportunities of the NBN. These barriers include many Indigenous households not having an existing fixed line, computer or internet access; cost barriers; perceptions that the technology is out of reach or too 'grand or superior' for some Australians; a lack of public access computer facilities; and a lack of training and support.<sup>30</sup>

## Older Australians

- 8.33 Dr Williams' report, *Connecting Communities*, includes statistics indicating that in the UK, three million people aged over 65 go longer than a week without seeing a friend, and 1.8 million go for more than a month.<sup>31</sup> The Committee heard that many elderly Australians also suffer from this type of social isolation, with the problem likely to increase as the population ages.<sup>32</sup> At the same time, the ABS found that nearly 70 percent of the 2.7

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27 IRCA, *Submission 82*, p. 13.

28 Eastern Regional Digital Corridor, *Submission 141*, pp. 14, 18.

29 Kiama City Council, *Submission 39*, p. [2].

30 RDA Far West NSW, *Submission 127*, pp. 6-7.

31 Dr Tim Williams (Huawei), *Connecting Communities: The impact of broadband on communities in the UK and its implications for Australia*, February 2011, p. 18.

32 National ICT Australia (NICTA), *Submission 198*, p. 31.

million Australians aged 65 years and over did not access the internet in 2008–09. This compares to just nine per cent of those aged 18 to 24.<sup>33</sup>

- 8.34 The Australian Local Government Association (ALGA), among others, told the Committee that access to broadband can be a powerful tool to help combat social isolation among older people:

As broadband technologies become more affordable, an increasing number of older Australians will be able to access the internet. Although social isolation is not limited to older people, they form the greatest proportion of those who are classed as socially isolated. Older people in rural and remote areas and those who have mobility restrictions, through age or disability, are particularly at risk of social isolation. Access to the internet provides opportunities for learning, stimulation and contact.<sup>34</sup>

- 8.35 National ICT Australia (NICTA) advised that social isolation ‘can be mitigated by educating the elderly about the benefits of being online and providing them with access to social networking tools that can make a real difference in their lives’. NICTA went on to say that ‘these tools, coupled with other broadband-enabled remote monitoring services, facilitate independent living for the elderly, reducing pressure on aged care facilities’.<sup>35</sup>

- 8.36 Mr Daniel Brinkworth, Manager of ICT for Victor Harbour City Council, told the Committee that many people choose to retire in his region, requiring them to move away from friends and family. Mr Brinkworth said that broadband could help retirees keep in contact with those people:

It is expected that on an individual level the introduction of better broadband services will assist residents, particularly retirees, to maintain contact with their family members and friends. It is expected that traditional types of communication such as voice-only telephones will be replaced with the ability to make video calls and the ability to interact with multiple groups at once, share pictures and videos all in real-time and, as prices lower, increase the amount of time spent communicating with loved ones.<sup>36</sup>

- 8.37 Similarly, RDA Yorke and Mid North submitted that retirees are able ‘to maintain contact with their family without leaving their regional

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33 ABS, *Household Use of Information Technology Australia 2008 09*, 16 December 2009, p. 35.

34 ALGA, *Submission 139*, pp. 12–13.

35 NICTA, *Submission 198*, p. 31.

36 *Committee Hansard*, Victor Harbor, 5 April 2011, p. 4.



community', through using improved Skype, photo sharing and video linkages.<sup>37</sup>

- 8.38 Peel SeniorNet, an online seniors' group based in Mandurah, Western Australia, gave the Committee some suggestions on the type of barriers that need to be overcome to encourage seniors to connect:

As seniors who use broadband, the world can be opened up rather than closed down with ageing. However, expenditure and software costs and extravagant over-costing of cartridges, inks, etc. put seniors off from investing in technology. ISP charges need to be free for seniors and much broader discounts for goods provided.<sup>38</sup>

- 8.39 ALGA told the Committee that while older Australians are actually increasing their use of the internet faster than any other age group, education, training and new interactive technologies will need be delivered to realise the benefits for this age group:

There is an opportunity for the development of interactive technologies to specifically address social isolation. This must be accompanied by education and training opportunities to overcome the reluctance of many older people to use new technologies. Products specifically designed for older people could target the most isolated and at risk groups.<sup>39</sup>

- 8.40 'Broadband for Seniors' is a program currently funded by the Federal Government, and the Committee notes the recent announcement that funding will continue for an additional four years.<sup>40</sup> This program funds the operation of 2000 broadband kiosks across Australia and delivers free computer and internet training for seniors. ALA, which is involved in the operation of the program, told the Committee:

The seniors involved report increased access to grandchildren and friends, of regularly hearing from family overseas, of accessing services online rather than attending in person and of feeling confident to volunteer in environments where computers are regularly used.<sup>41</sup>

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37 RDA Yorke and Mid North, *Submission 121*, p. 13.

38 Peel SeniorNet Association, *Submission 175*, p. [2].

39 ALGA, *Submission 139*, p. 13.

40 'Delivering for Senior Australians', *Joint Media Release*, 10 May 2011  
<[http://www.jennymacklin.fahcsia.gov.au/mediareleases/2011/Pages/b08\\_10052011.aspx](http://www.jennymacklin.fahcsia.gov.au/mediareleases/2011/Pages/b08_10052011.aspx)>, viewed 25 July 2011.

41 ALA, *Submission 163*, p. [2].

- 8.41 ALA added that the NBN could significantly enhance the Broadband for Seniors program:

The potential of an NBN to enhance social inclusion programs like Broadband for Seniors is enormous. The higher the internet speed, the higher the capacity for peer to peer networking to mimic face to face human interaction and therefore the more likely that programs like Broadband for Seniors will bring in people unwilling or unable to deal with the slow speed of our current internet systems.<sup>42</sup>

## Australians with disabilities

- 8.42 The Committee received evidence that the disability sector stands to particularly benefit from the roll out of high-speed broadband. The ABS found that in 2006, only 28 per cent of people who required assistance for their core activities had broadband access, compared to 48 per cent of the general population.<sup>43</sup> Physical Disability Australia (PDA) told the Committee that social isolation is currently a significant issue for many people with a disability:

People with disability repeatedly experience isolation as many are unable to leave their own home due to the restrictions of their disability or need assistance to leave their houses. This issue alone will affect the ability to be employed in traditional work or to circulate in their own community.<sup>44</sup>

- 8.43 The Committee heard that new technologies coupled with the NBN could help to reduce social isolation. ACCAN, among others, described how high-speed broadband could be used to greatly enhance the quality of life for people with disabilities:

As a recent report commissioned by ACCAN has shown, benefits of high-speed broadband for people with disabilities include: TV 'access service' applications such as audio description and signing; TV-based videophones; medical services; lip-reading possibilities; video-relay services; video remote interpreting; talking books; converting printed text to the spoken word; smart living or remote monitoring applications.

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42 ALA, *Submission 163*, p. [2].

43 ABS, *Patterns of Internet Access in Australia*, 29 November 2007, p. 9.

44 PDA, *Submission 164*, pp. 2-3.

- 8.44 Ms Leah Hobson, National Policy Officer at the Australian Federation of Disability Organisations (AFDO), told the Committee that the NBN could provide exciting new opportunities for people with disabilities. These include the ability for people who are largely confined to their house to interact face-to-face with other people more often; the ability for deaf or hearing impaired people to communicate over video in Auslan; and the ability for blind children to immediately download talking books from an online repository instead of waiting for them to be available from a library.<sup>45</sup>
- 8.45 The Australian Federation of Deaf Societies (AFDS) told the Committee that deaf and hearing impaired people can face particular difficulties with regards to social isolation:
- The ability to communicate and interact with others is important to all people. Deaf people are no different, but they can find it difficult and often impossible, to communicate through methods traditionally used by hearing people ... This can isolate deaf people from their community and put them at risk through chronic homelessness, mental illness and un/underemployment.<sup>46</sup>
- 8.46 AFDS explained that the deaf and hard of hearing community is likely to receive many positive impacts from the NBN, resulting in major 'social, employment and educational benefits'. The submission said that:
- Given the visual nature of Auslan, the potential for the NBN to allow deaf and hard of hearing people to communicate using video-conferencing and other video communication tools such as Skype is likely to be the biggest benefit for the deaf community.<sup>47</sup>
- 8.47 The Committee also heard that the NBN could enable new types of employment opportunities to open for people with disabilities, resulting in increased workforce participation. PDA submitted that:
- Employment using the internet is in our belief an untapped area of labour potential for people with disabilities who experience any number of difficulties in employment outside the home. PDA has for 15 years employed staff to work from home using internet, email and telephone and this has worked to our satisfaction without impacting on the disability of the staff.<sup>48</sup>

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45 *Committee Hansard*, Melbourne, 18 March 2011, pp. 78, 79, 82.

46 *AFDS, Submission 119*, pp. [7–8].

47 *AFDS, Submission 119*, p. [3].

48 *PDA, Submission 164*, p. 4.

### Box 8.1 Video Relay Interpreting

Video Relay Interpreting (VRI) is technology that allows interpreters, deaf and hearing people to communicate through video link. This removes the need for an interpreter to travel and thus facilitates more ready access to interpreting services. Although VRI is being trialled in some areas, access is currently limited to specified sites that have connections capable of handling the upload and download speeds required for high-quality video communication.

The Australian Federation of Deaf Societies (AFDS) believes that the NBN will enable greater use of VRI, giving employers, hearing impaired employees and interpreters much greater flexibility. This is likely to result in greatly improved communications as well as improved employment outcomes.

In addition, the use of VRI through Skype is likely to result in improved access to government services and programs, health services, and educational resources.

Source: AFDS, *Submission 119*.

8.48 However, Ms Hobson of the AFDO cautioned that while increased employment opportunities could ‘very clearly benefit people with disability’, it would not be a good outcome if people with disabilities were only able to work at home because the rest of the built environment was inaccessible.<sup>49</sup>

8.49 In order to take advantage of the potential of the NBN for people with disabilities, the Committee heard that action would be required from governments. ACCAN submitted:

Government should focus on supporting the development and implementation of these types of applications. Government action will be required as the private sector tends to be reluctant to introduce new services of benefit to people with disabilities when there are uncertainties about their likely take-up and commercial viability.<sup>50</sup>

8.50 In similar terms, Ms Hobson told the Committee:

There has to be an understanding that, when it comes to people with a disability, the market does not always provide. Simply setting up a national broadband network and leaving it to the

49 *Committee Hansard*, Melbourne, 18 March 2011, p. 79.

50 ACCAN, *Submission 128*, pp. 4–5.

market to say, 'People with disability will automatically be covered. Everything will suddenly become accessible,' is not going to work that way.<sup>51</sup>

- 8.51 Ms Hobson suggested affordability and targeted education programs would be the key areas requiring government attention:

When we are implementing this, we do need to make sure that the costs are kept low for people with a disability and low socioeconomic backgrounds. I am also mindful that, when the NBN is rolled out, we need to make sure that education about it is appropriate for a whole range of groups ...<sup>52</sup>

## Australians from culturally and linguistically diverse backgrounds

- 8.52 According to the ABS, 35 per cent of Australians born in non-English speaking countries did not access the internet in 2008–09. This compares with 24 per cent for people born in Australia, and 21 per cent for people born in the other main English-speaking countries.<sup>53</sup>
- 8.53 The Committee heard that the NBN would help non-English speaking Australians to increase their interaction with the local community and connect with their friends and relatives overseas.<sup>54</sup>
- 8.54 The NBN will also increase the availability of foreign language resources to Australian communities. SBS told the Committee that 'faster broadband speeds will create more opportunities for communities to engage with content created by SBS through online video and audio services, on-demand access, and other new services including third party content distributors.'
- 8.55 SBS informed the Committee about its recently launched Chinese language Virtual Community Centre (VCC):
- The VCC provides a new online destination for Chinese Australians. It is targeted to the needs of Australia's Chinese language community and provides content in Mandarin and Cantonese (with some English). The VCC aggregates all SBS content in Mandarin and Cantonese, with additional selected and commissioned online content. For example audiences can watch

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51 *Committee Hansard*, Melbourne, 18 March 2011, p. 81.

52 *Committee Hansard*, Melbourne, 18 March 2011, pp. 82–83.

53 ABS, *Household Use of Information Technology Australia 2008–09*, 16 December 2009, p. 35. 'The other main English-speaking countries' are not specified.

54 Canterbury City Council, *Submission 7*, p. [1]; Penrith City Council, *Submission 81*, p. [1].

video catch-up versions of SBS’s pilot Mandarin News Australia

...

The VCC enables a deeper and richer engagement with SBS’s Mandarin and Cantonese speaking audiences and enables those audiences to create their own communities of interest and share their Australian stories.<sup>55</sup>

- 8.56 These benefits aside, SBS’s submission identified two potential risks associated with faster broadband. Firstly, ‘there is a danger that the proliferation of new services over the NBN will affect the availability of Australian content’, primarily due to the lack of local content obligations for online content. Secondly, the increased availability of in-language overseas content could cause local communities to ‘retreat inward’, increasing the risk of ‘digital ghettos’ forming for culturally and linguistically diverse communities as they have less of an incentive to engage with the broader Australian community.<sup>56</sup>

## Enabling new methods of community interaction

- 8.57 The Committee received evidence that the NBN would enable new and better opportunities for community groups to engage with their members and interact over large geographical distances. NICTA submitted:

A ubiquitous broadband network goes some way in ensuring that [the freedom to choose one’s own religion, hobbies and friends] is extended to all citizens, and that all citizens can associate with groups of their choosing (within reason), no matter where the other members of this group might be in the world. The NBN will support:

- Diversity, by enabling people to connect with others who share the same religions and cultures;
- The pursuit of niche interests, hobbies and pastimes by enabling individuals to connect with people around the world who share similar interests; and
- The creation of online communities that relate to various niche interests, founded upon the sharing of rich media.<sup>57</sup>

- 8.58 The Government of South Australia submitted:

55 SBS, *Submission 170*, p. 2.

56 SBS, *Submission 170*, p. 2.

57 NICTA, *Submission 198*, p. 33.

The NBN is likely to have a large impact on what we consider to be a 'community' as a wide range of communities will be created online connecting people who are around the corner from each other or around the world. Communities will not only be people who live near each other but also those who have interests in common that connect online. Communities will use a range of online tools which are free to access and often free to use (other than the cost of the internet connection) such as:

- Voice over Internet Protocol (VoIP);
- video chat and conferencing;
- free and open source software such as web-based applications, for example Google Apps, Yahoo Mail and MSN Messenger; and
- social networking to connect, share information, organise events and create communities.<sup>58</sup>

8.59 The Committee heard from community groups that envisaged benefits arising from the NBN. For example, Mr Mark Freeman, President of the Kuranda 8 Ball Association, told the Committee that the NBN would allow the association to conduct its meetings over video-conferences, removing the need to travel long distances and hire facilities.<sup>59</sup> Mr Robert Cook, Secretary of the Melbourne Electric Vehicle Interest Group, described the group's use of a broadband-enabled technology platform called rivusTV to interactively broadcast its meetings to individuals anywhere in Australia.<sup>60</sup> RDA Illawarra submitted that the NBN could enable traditional community groups such as Rotary, Apex and the Red Cross to address their declining membership numbers by allowing people to join groups online and participate remotely.<sup>61</sup>

8.60 The AIIA cited in its submission research from overseas suggesting that members of online communities were more likely to be involved in civic activities since connecting to the internet.<sup>62</sup> A recent survey in the US found that 80 per cent of internet users are involved in some kind of volunteer group or organisation, compared to 56 per cent of non-internet users. Internet users, particularly users of social media, had higher rates of charitable donations, volunteering, meeting and event attendance and leadership roles.<sup>63</sup>

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58 SA Government, *Submission 195*, p. 13.

59 Mr Mark Freeman, *Submission 28*, p. 1.

60 Robert Cook, Alternative Technology Association, *Submission 161*, p. [1].

61 RDA Illawarra, *Submission 90*, p. 4.

62 AIIA, *Submission 184*, p. 23.

63 AIIA, *Submission 184*, p. 24.

- 8.61 Huawei described ‘this new era of online engagement’ as a benefit to democracy, where ‘broadband will allow citizens who were once unable to engage with Government to actively participate online ...’:

A National Broadband Network will allow Government to re-shape itself online as a ‘Participative Platform’, where the online community can offer feedback on anything from potholes in roads, to graffiti on local landmarks, to campaigns against new developments. And on the other side of the fence, broadband is already allowing politicians to all levels to engage with their constituents – through mediums like Twitter, logs, YouTube, Facebook and more.<sup>64</sup>

## Improving work–life balance

- 8.62 The Committee heard about the NBN’s potential to improve the work–life balance of Australians by encouraging more flexible work practices such as tele-working. Tele-working has been discussed in general terms elsewhere in this report; the focus in this section is on particular benefits in a social and community context. An Access Economics report into tele-working in the context of an NBN identified such benefits as follows:

- personal savings on travel in time and money;
- greater choice in place of residence;
- greater access to family;
- reduced impact on road and public transport infrastructure; and
- potential for greater involvement in their local community by the tele-worker.<sup>65</sup>

- 8.63 Mr Bob Carmichael, Manager of Business and Economic Development at the City of Tea Tree Gully, described the benefits of tele-working for the environment and productivity:

If [people] currently have to drive for 45 minutes twice a day, five days a week, those are so many more hours they could be working from home. They would be more productive and they could be

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64 Huawei, *Submission 105*, p. 13.

65 Access Economics, *Impacts of Teleworking under the NBN*, July 2010; as summarised by DBCDE, *Submission 215*, p. 83.



more flexible. It would be more in keeping with work-life balance if they did not spend so much time commuting.<sup>66</sup>

8.64 DBCDE told the Committee about the particular benefits of broadband for small business owners, indicating evidence to suggest that high-speed broadband will improve daily life, referring to one survey which noted 'a better work-life balance in 82 per cent of small businesses who moved to broadband connections when compared to dial-up connections.'<sup>67</sup>

8.65 The flexibility of employees to 'work anywhere anytime' was identified as one of the key benefits of tele-working. The Department of Innovation, Industry, Science and Research (DIISR) outlined to the Committee the findings of a 2006 internal study conducted by IBM, which assessed the company's workforce mobility policy:

... over 70 per cent of employees felt that working remotely positively enhanced their work-life balance, improving productivity, morale and motivation. In terms of retention, the flexibility of working from home resulted in a 96 per cent return rate from parental leave.<sup>68</sup>

8.66 David O'Loughlin, Mayor of the City of Prospect, told the Committee that his City has set up wireless 'hotspots' that allow people to work in local cafes rather than travelling to a designated workplace:

... there is the nice idea that you may be able to build more of a neighbourhood by having people working closer, using that kind of technology. We now have people working in our hotspots. Whilst they are having a coffee they are having a meeting, and they will be using things like iPads. Who knows what is going to come out next year. They are doing commerce whilst having a coffee outside a beautiful cafe under the plane trees. Why wouldn't you do that if you could?<sup>69</sup>

## **New entertainment possibilities**

8.67 While the majority of this report has focused on more practical applications, the Committee also heard that the NBN will enable Australians to take part in new and better forms of electronic

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66 *Committee Hansard*, Adelaide, 4 April 2011, pp. 33-34.

67 DBCDE, *Submission 215*, p. 83.

68 DIISR, *Submission 219*, p. 43.

69 *Committee Hansard*, Adelaide, 4 April 2011, p. 69.

entertainment, including Internet Protocol Television (IPTV), video on demand and online gaming.

8.68 As opposed to traditional broadcast television, IPTV is the name given to video that is streamed to users over their broadband internet connection. Video on demand refers to the ability for users to watch video content at a time of their choosing, unrestricted by schedules.<sup>70</sup> The NBN will increase the availability of broadband speeds that are fast enough to support these technologies.

8.69 Mr David Buckingham, Chief Financial Officer of iiNet, who currently offer their customers IPTV using the company FetchTV, told the Committee that IPTV requires broadband speeds of at least 5 Mbit/s to be acceptable to users.<sup>71</sup> NBN Co's Corporate Plan predicts that IPTV and video on demand will become more widely available in the next one to five years, and will require sustained connections of 10 to 20 Mbit/s to be viable. NBN Co expects that in the longer term, technologies such as 'Ultra High Definition' video will be developed requiring connections of more than 250 Mbit/s.<sup>72</sup>

8.70 Mr John Stanton, Chief Executive Officer of Communications Alliance, told the Committee about some of the potential of IPTV:

We are not talking about television, we are talking about video. The sorts of changes that intelligent IPTV can and will make to the viewing experience and the way that we can use video in our homes will drive a lot of economic activity, a lot of take-up and use a lot of bandwidth going forward. I have seen demonstrations in Asia of the way that intelligent IPTV systems, even in their first generation, can scour the world for video content that they know their owner likes, can edit it and present it in ways that create a much different viewing experience than we are able to see today.<sup>73</sup>

8.71 The NBN is also likely to support enhanced online gaming and game development. The IT Industry Innovation Council submitted that the NBN will support the competitiveness of the Australian game development industry, which currently exports almost 100 per cent of its product, and works with publishing partners in the US, Europe and Asia:

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70 NBN Co, *Corporate Plan 2011–13*, pp. 155, 159.

71 *Committee Hansard*, Perth, 5 May 2011, p. 7.

72 NBN Co, *Corporate Plan 2011–13*, p. 39.

73 *Committee Hansard*, Sydney, 29 April 2011, p. 35.

... Companies that are doing well in Australia are those that, having recognised the shift away from packaged titles/retail models to downloadable digital games, have adjusted their business model and investments accordingly ... With high speed complex games requiring a high speed broadband network, this industry sector can only benefit further from the NBN as the preferred delivery model for online interactive gaming.<sup>74</sup>

- 8.72 The Committee received evidence that an advantage of the expansion of the computer gaming industry is that many of the new technologies it develops can also be adapted for more practical purposes. Games and their technologies are increasingly being used as tools for education and rehabilitation, as described in Chapters 3 and 4. DIISR told the Committee that games technology is also being used to develop training activities for the defence sector.<sup>75</sup>
- 8.73 Ms Veronica Maxville, an ICT industry professional, told the Committee that the games industry has a lot to offer other sectors in terms of the useability and durability of its products:

In terms of software development, our software at the moment is quite often not very easy to use. One of my beliefs is that games technology is somewhere that we can look at for how we should be developing software and the equipment that we are using. If you have DS or Wii or any of those games consoles, they do not break, they do not get a 'blue screen of death' ... It does not need a manual, kids can play it before they can read, and it does not break. All you have to do is reboot. That is so different from your Windows machine that is going to get a virus on it if you do not have all your protections up within 30 seconds of connecting to the internet.<sup>76</sup>

## Better access to arts and culture

- 8.74 The Australia Council for the Arts told the Committee that broadband technology would have 'transformative effects on the creation and consumption of arts':

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74 ITIIC, *Submission 111*, p. 8.

75 Mrs Judith Zielke, Head, Enterprise Connect Division, DIISR, *Committee Hansard*, Canberra, 6 July 2011, p. 10.

76 Ms Veronica Maxville, *Committee Hansard*, Perth, 5 May 2011, p. 33.

The NBN ... will allow anytime, anywhere access to creative and cultural content. It will make possible entirely new forms of connection between arts producers and audiences, and strengthen networks connecting artistic talent, skills and resources throughout the sector. Most artists and arts organisations are small to medium-sized businesses and the NBN will make it easier for them to connect and collaborate with each other. The NBN has the potential to move us towards a more level playing field for the creation and consumption of the arts between regional and metropolitan areas, reducing the tyranny of distance. Further, the NBN will catalyse new forms of connection between organisations in Australia and internationally, making it easier for Australian artists to take their art to the rest of the world.<sup>77</sup>

- 8.75 The Council also submitted that broadband enables artists to increasingly use new interactive digital technologies and business models:

Artists are creating work that invites audiences to move beyond passively viewing, watching or listening to arts content, and instead encourages them to try stepping inside artwork, contributing to its creation – and in some cases even wearing the artwork. Arts content in digital formats can be copied, shared and repurposed. While encouraging creative interactions, this is creating challenges for those seeking to protect and monetise content, and is transforming traditional business models (which were based on one-off pieces and events). Digital distribution and consumption of arts content opens up new ways of doing business and earning income (such as increasing royalties through posting online back catalogues).<sup>78</sup>

- 8.76 The Council noted that the NBN could dramatically improve access to the arts in regional areas:

For regional consumers, the NBN will have positive outcomes for regional populations by providing greater access to arts content created locally or anywhere on the planet. And the NBN will support regional and rural arts and culture organisations and creative industries, as well as individual artists and practitioners, connecting networks of artworkers to each other and to new markets.<sup>79</sup>

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77 Australia Council for the Arts, *Submission 232*, pp. 5, 7.

78 Australia Council for the Arts, *Submission 232*, p. 8.

79 Australia Council for the Arts, *Submission 232*, p. 8.

- 8.77 A number of other submitters shared this view. For example, the Government of South Australia told the Committee that NBN-facilitated access to the arts in regional communities will 'enhance the quality of life and richness of local communities':

Regional communities do not have access to the same arts/cultural experiences as those in Adelaide do, but have many grass-roots interests and capabilities. Local arts interests are the life blood for most regional communities. An enhanced digital environment provided by the NBN will offer the following benefits:

- a new, accessible medium for creating arts;
- a new medium for people to connect and contribute (for example, the success of Eric Whitacre's virtual choir, viewable on YouTube; virtual orchestras, bands and other virtual productions; or uploading photographs to Google Maps or Photosynth);
- access to special arts experiences (for example, virtual tours of galleries and digital recordings of events).<sup>80</sup>

- 8.78 The Music Council of Australia told the Committee that the NBN could enable the online broadcast of live or recorded performances, including rarely available musical works.<sup>81</sup> Ms Suzie Hazelhurst, Chairwoman of Country Arts WA, recently wrote:

The roll-out of the National Broadband Network is an important development for regional communities. Access to a Perth performance of the Berlin Philharmonic Orchestra or Black Swan Theatre's *A Midsummer Night's Dream* was once an impossibility for the average person living far from our capital city. The NBN will put these experiences within the reach of the majority of the one in three West Australians living in the bush.<sup>82</sup>

- 8.79 The Committee also heard that the NBN could improve the accessibility of Australia's museum collections. The Council of Australasian Museum Directors informed the Committee that most major museums have developed online digital services, as less than three per cent of their collections is able to be exhibited at any one time. The NBN will enhance these services:

The NBN holds the potential to dramatically increase the ability of these online programs to reach and engage new audiences ... For

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80 SA Government, *Submission 195*, p. 13.

81 Music Council of Australia, *Supplementary Submission 148.1*, p. 11.

82 Susie Hazelhurst, 'Arts vital to bush health', *West Australian*, 13 July 2011, p. 2 Supplement.

the first time since the advent of public internet services, it will be possible to engage and connect all Australians through rich media content and interactive, participative experiences. The social, educational and economic benefits of government investment in museum services will be significantly enhanced as museum collections and expertise are made available in new, responsive ways, unencumbered by the constraints of bandwidth and geography.<sup>83</sup>

8.80 Museums Australia told the Committee that the NBN could enable larger institutions to professionally support smaller regional museums, and that further to this:

... greater access to broadband and greater take-up of digital services can broaden the reach of community museum and community history projects – which are vital in support of tourism nationally. Comparable increased support for Indigenous Keeping Places, cultural centres, and their communities must also be profiled as an important social and cultural policy goal. The benefits of greater sharing of cultural heritage knowledge are twofold at the regional level: better support of smaller collecting organisations enriches the volunteering experience for those who are caring for smaller collections ... meanwhile, culturally active communities are healthier communities ...<sup>84</sup>

8.81 Other submitters also drew the link between the arts and the health of communities. RDA Northern Rivers submitted:

[The Arts] has an important role in facilitating social cohesion and providing a forum and framework for ... celebration and expression in individual and community identity and aspiration.

The provision of access to high speed broadband will enable a greater degree of engagement and connectivity across the region. Many people in regional areas are isolated and as a result not as aware of opportunities and information that is vital to their own, their family's and their community's development, and their ability to participate and contribute is consequently affected.<sup>85</sup>

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83 Council of Australasian Museum Directors, *Submission 168*, p. 3.

84 Museums Australia, *Submission 162*, p. 8.

85 RDA Northern Rivers, *Submission 55*, p. 14.

## Better access to information and digital media

8.82 The Committee acknowledges DBCDE's claim that:

High-speed broadband lowers the cost of searching for and finding information, primarily in terms of the user's time, and may also provide users with access to lower priced services.<sup>86</sup>

8.83 The Committee also acknowledges the views expressed by DBCDE about the benefits of digital engagement for Australian consumers. These benefits may include:

- enhanced communication through email, instant messaging, VoIP and other services;
- time saving activities including telecommuting, online shopping, remote work and study opportunities, information gathering and accessing services;
- price/product discovery;
- education and knowledge;
- access to new online services such as social networking, media/entertainment and professional services;
- substitution of physical services to services delivered electronically; and
- engagement in the online community.<sup>87</sup>

8.84 As an example of the new types of information that could become publically available, Gold Coast City Council told the Committee that the NBN could enable it to interconnect all its Surf Lifesaving facilities and services, enabling them to share with the public live video of beach conditions, sporting events, and education and training sessions.<sup>88</sup>

8.85 NICTA told the Committee about the NBN's potential to facilitate 'hyperlocal' media:

[The] NBN will enable people to create, contribute and share as easily as they can consume ... Symmetric high-speed broadband will enable and encourage:

- User-generated content creation and dissemination;
- The collection and dissemination of environmental and other data by 'citizen scientists' ...
- Citizen journalism;

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86 DBCDE, *Submission 215*, p. 82.

87 DBCDE, *Submission 215*, p. 82.

88 Gold Coast City Council, *Submission 71*, p. 7.

- Diversified local news sources;

When it is possible for anyone with a laptop and camera or even just a smart phone to capture events as they unfold in their home towns, you have the beginnings of hyperlocal news publishing for and by the citizens: citizen journalism. But this also requires that would-be news reporters have the means to upload their stories, complete with rich video content, to the online news service, a scenario made possible only by adequate broadband networks. The NBN has the potential to catalyse this nascent activity.<sup>89</sup>

- 8.86 The NBN will also enable libraries to greatly expand their online services. For example, Eastern Regional Libraries Corporation (ERLC) submitted that the NBN would allow:

... more of our communities to access our online 24/7 services through improved internet access. ERLC has over 780,000 visits per annum to its website ([www.yourlibrary.com.au](http://www.yourlibrary.com.au)) by people wanting access to all kinds of information, including authoritative databases and our catalogue where they can reserve any item in the collection. The rollout of [the] NBN to all our communities would undoubtedly lead to further growth in our 24/7 services ...

NBN will reinforce ERLC's use of technologies and support its own rollout in downloadable materials (e-books, music and video) and in the social networking arena through Facebook and Twitter.<sup>90</sup>

- 8.87 Mr Carmichael of the City of Tea Tree Gully told the Committee:

Access to the National Broadband Network would also enable us to improve our digital literacy training and improve our social and information services to all of our residents, including students. We are also keen to be able to use the National Broadband Network to develop an e-book service as a new digital service for our 37 157 active library members.<sup>91</sup>

- 8.88 National and State Libraries Australasia (NSLA) told the Committee that the collections of the ten major publicly-funded research libraries of Australia and New Zealand are 'irreplaceable assets' with a current value of more than \$5 billion.<sup>92</sup> NSLA added:

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89 NICTA, *Submission 198*, p. 33.

90 ERLC, *Submission 221*, p. [2].

91 *Committee Hansard*, Adelaide, 4 April 2011, p. 27.

92 NSLA, *Submission 53*, p. 1.



All information is now expected to be online ... The NBN will enable the community to use, adapt, create and transform our collections as they become available in digital form and more readily access the global information network. File sizes are increasing as film, oral history, research data sets, archival collections and high quality images are digitised and made available online. The NBN will have the capacity to carry this content to all Australians.<sup>93</sup>

- 8.89 However, NSLA submitted that government support will be required during the NBN rollout to digitise more Australian content and make it available online. It told the Committee about research that has found that for every one dollar invested in digitisation, over twenty dollars of economic benefit is returned,<sup>94</sup> and that 'digitisation makes information discoverable by everyone and gives access to those residing in regional, rural and remote areas who cannot access physical libraries'.<sup>95</sup> NSLA warned that:

Australia lags many other countries in directing extensive public funding to mass digitisation and the pressure to address this is growing. Failing to digitise will result in a much-reduced Australian cultural presence on the web. For the community, finding Australian content via the NBN will be critical to its use and reputation.

Along with the digitisation of our collections, a central and inter-linked challenge for libraries is the long-term preservation of digital assets whether born-digital or digitised from another format. The processes to digitise are tested and robust and all that is required to gear up to mass digitisation is funding.<sup>96</sup>

- 8.90 The Committee heard that while the NBN is 'critical infrastructure' for Australians to access digital collections,<sup>97</sup> the National Library of Australia (NLA) explained that to date, less than four per cent of the its collection is digitised, and there is a 'pressing need' for national funds to expand the digitisation effort.<sup>98</sup> The NLA described its free online service, *Trove*, which 'allows the public, and researchers, to [find and] annotate collection

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93 NSLA, *Submission 53*, p. 1.

94 NSLA, *Submission 53*, p. 2. The NSLA submission refers to a 2008 Access Economics report.

95 NSLA, *Submission 53*, p. 1.

96 NSLA, *Submission 53*, p. 2.

97 NSLA, *Submission 53*, p. 2, and NLA, *Submission 106*, p. 2.

98 NLA, *Submission 106*, p. 2.

items held by more than 1000 Australian libraries, a wide range of other collecting institutions, and major digitised book, journal and newspaper collections'.<sup>99</sup>

**Box 8.2 Virtual Museum of the Pacific (VMP) Project**

The Australian Museum is reconnecting communities from the Pacific with intangible and material heritage lost in the colonial period.

The Virtual Museum of the Pacific (VMP) project includes digitising cultural objects, bringing culturally knowledgeable members from communities to annotate the information linked with the collections, establishing field programs where communities can digitally document and preserve their own intangible heritage and, more recently, working to provide a web tool which allows easy, intuitive searching for related objects by type and creator community.

The project maximises the value of new and existing metadata, publishes the museum's content to the web without expensive, hard-wired programming and promotes forms of cultural revitalisation which underpin community coherence and national stability.

The Council of Australasian Museum Directors argues that the high speed connectivity offered by the NBN will both feed and harness projects such as the VMP.

Source: Council of Australasian Museum Directors, *Submission 168*, p. 12.

- 8.91 Museums Australia highlighted the contribution that digitised content can make to enriching the public's awareness and understanding of Australia's culture and heritage:

The story of Ned Kelly; the discovery of gold; the experience of drought, flooding and bushfires; immigration's contribution to development; the national and local experiences of war: all these themes would lead audiences and researchers to many different types of institutions holding material that illuminate them. Greater digitisation and access to digital initiatives, as spurred by the NBN's roll-out, would enrich our knowledge and the value of significant objects in collections, by making related objects and records held in different institutions more discoverable. The NBN

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<sup>99</sup> NLA, *Submission 106*, p. 5.

provides the opportunity for the museums sector to build improved digital links, both for researchers and the public's enrichment. This could stimulate better sharing of information, research opportunities and enhanced understanding of those collections by the inheritors of the legacy of our nation's achievements collectively.<sup>100</sup>

## Crime and safety considerations

- 8.92 The Committee received evidence that the NBN presents both opportunities and risks in the areas of crime and safety.
- 8.93 NICTA argued in its submission that safety and security could 'benefit heavily' from the NBN's rollout. The opportunities will include:
- Outsourcing of the monitoring of council public safety cameras to centralised, dedicated facilities, reducing costs;
  - Remote monitoring of a home by the homeowner or someone trusted by the homeowner, like a friend, family member or specialist home security firm; and
  - Remote access control, whereby the homeowner can remotely allow or disallow access to their home by tradespeople or delivery people.<sup>101</sup>
- 8.94 As an example of security management by councils, NICTA submitted:
- Ipswich City Council has established itself as a world leader in public safety surveillance monitoring with its Safe City program. Several regional councils in Queensland and interstate are considering outsourcing the monitoring of their own surveillance cameras to Ipswich City Council's monitoring facility. The NBN can simplify and greatly reduce the cost of these kinds of inter-council collaborations .... NICTA is working with the Ipswich City Council to automate some monitoring tasks, such as detecting road rage or dangerous driving behaviour on highways ...<sup>102</sup>
- 8.95 With regards to home security systems, NICTA submitted:
- ... the NBN brings greater opportunities for homeowners to remotely monitor their homes, and for security companies to offer smarter home monitoring solutions. While some home security

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100 Museums Australia, *Submission 162*, p. 7.

101 NICTA *Submission 198*, p. 32.

102 NICTA *Submission 198*, p. 32.

firms already use the Internet to enable ‘back-to-base’ monitoring, these solutions do not collect and transmit rich data of the kind that might be usable in a prosecution. Low bandwidths also inhibit the ability for homeowners to conduct their own remote video surveillance of their residences, and curtail the growth of certain ‘smart home’ applications.<sup>103</sup>

- 8.96 Mr Nicholls of Curtin University told the Committee about an ‘intelligent’ security system installed in a project at the Institute for Microprocessor Control, using around 100 video cameras in fixed locations:

The video footage has algorithms run over it and it is trained to understand what normal behaviour is. When it sees an anomaly it detects that and it captures that bit of footage and will send it to a central observation point. So, instead of securing people and having to manage and watch banks of video footage or not capture what is happening, they will actually have the car accident or the physical assault that is occurring. That is an application that would be better enabled by broadband technologies.<sup>104</sup>

- 8.97 However, the Committee also heard from some submitters that the NBN would increase the threats of cyber-crime. Senetas, a data security company, submitted to the inquiry:

As a high speed, high bandwidth, globally-connected information conduit, the NBN leaves Australia’s individuals and businesses open to the growing international threat posed by cybercriminals. Without a properly designed security focus, deployed through dedicated encryption hardware, communications from and to governments, enterprises, small businesses, researchers/innovators and individuals poses a significant risk.<sup>105</sup>

- 8.98 The Alannah and Madeline Foundation submitted that there are a range of safety risks associated with online digital technologies, including:

- abuse of children online (cyber-bullying, cyber-stalking and sexual grooming);
- exposure to illegal and inappropriate content;
- inappropriate social and health behaviours in an online environment (e.g. technology addiction, online promotion of anorexia, drug usage, underage drinking and smoking);

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103 NICTA *Submission 198*, p. 32.

104 *Committee Hansard*, Perth, 5 May 2011, p. 23.

105 Senetas, *Submission 1*, p. [1].

- identity theft; and breaches of privacy.<sup>106</sup>

8.99 The Foundation's General Manager of Cybersafety, Ms Jacqueline Van Vugt, recognised the enormous potential benefits of broadband access, but also recommended that governments be aware of any negative impacts, and have strategies in place 'to contain and reduce those risks':

It is our position that, just as with the building of roads, when we come to the information superhighway the Government, through NBN Co, also needs to be mindful of what some of the risk mitigation strategies would be and to think about what a sustained, coordinated and really comprehensive behaviour and social change approach might bring in order to be able to contain those risks.<sup>107</sup>

8.100 The Committee also received submissions from organisations concerned about the increased potential for copyright theft under the NBN.<sup>108</sup> These organisations each recognised and welcomed the potential of the NBN to expand the digital economy, but warned that without a framework in place to protect online copyright there will be serious threats to the level of innovation and investment in quality Australian online content.

8.101 The Australian Content Industry Group (ACIG), which represents several other content industry organisations, told the Committee that its preferred solution would be an 'industry led solution in the form of a code agreed between content rights holders (and their representatives) and ISPs'. ACIG submitted that it:

... has asked the Government to facilitate an industry roundtable that would bring together representatives of the key content industries and internet service providers (ISPs) to start the process of drawing up an industry code of conduct to address the ongoing issue of copyright theft online. This Code would not only deal with illegal file-sharing, but contemplate other forms of infringement on the internet (either presently or in the future).<sup>109</sup>

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106 The Alannah and Madeline Foundation, *Submission 206*, p. 7.

107 *Committee Hansard*, Melbourne, 18 March 2011, p. 70.

108 Copyright Agency Limited, *Submission 92*; The Australian Content Industry Group, *Submission 108*; Australian Recording Industry Association, *Submission 112*; Australian Publishers Association, *Submission 136*.

109 ACIG, *Submission 108*, p. [2].

## Committee conclusions

- 8.102 As discussed throughout this report, the NBN has the potential to provide an enormous range of benefits to Australians and their communities. From a social and community perspective, the NBN could reduce social isolation, enable new forms of community interaction, improve the work-life balance of employers and employees, enable new entertainment options, improve access to arts and culture, and improve access to information.
- 8.103 For these benefits to be realised there is a need to ensure that as many Australians are connected to the network as possible. The Committee heard that, due to the ‘digital divide’, many of the Australians who could benefit the most from broadband currently have the lowest levels of online participation. Groups that have particularly low broadband usage rates include those in rural and remote areas, Indigenous Australians, the elderly, people with disabilities, and people from culturally and linguistically diverse backgrounds. The extent of accompanying measures implemented by governments will determine whether the NBN narrows or widens this digital divide. Education and affordability of access are two key areas that will need to be addressed.
- 8.104 The Broadband for Seniors program is an example of a successful government program that has delivered training to over 94 000 seniors in free broadband kiosks around Australia, resulting in real and measurable improvements to the online participation of those involved. The Committee welcomes the Federal Government’s recent decision to extend funding for Broadband for Seniors for another four years. Similar targeted programs may be required to ensure maximum NBN uptake amongst other disadvantaged groups, particularly Indigenous Australians in remote communities and people with disabilities. A variety of possible strategies for maximising the uptake of the NBN across Australia will be discussed in Chapter 11.
- 8.105 The Committee also heard concerns that people living in small communities in rural and remote Australia could miss out on many of the benefits of broadband if they are not connected to the NBN’s fibre network. While these concerns are valid, the Committee recognises the practicalities and cost of delivering fixed line services in remote areas. These issues are explored in Chapter 6 on economic development, Chapter 9 on network capacity and technology, and Chapter 11 on encouraging uptake.

- 8.106 There are substantial benefits that would result from expanding the digitisation of the nationally significant cultural and historical collections held by Australian museums, libraries and other institutions. An adequately resourced strategy will be required in order to increase the public accessibility and ensure the future preservation of these collections.
- 8.107 The Committee also recognises the large social and economic benefits of the NBN could be partially offset by the threat of by cyber-crime, including copyright theft and cyber-bullying. Given the work done in previous inquiries by this Committee and others, including the report tabled in June by the Joint Select Committee on Cyber-safety and the ongoing work of that Committee, the Committee does not propose to address the concerns raised by submitters in detail. However, the Committee does recognise the importance of these issues and the need for a coordinated government response. It looks forward to the Federal Government's upcoming white paper on cyber-crime, which is expected to be released in the first half of 2012.





## PART TWO



## Network capacity and technology

- 9.1 As is evident from the terms of reference, the inquiry had an outcomes focus – that is, what new or improved opportunities will be enabled by the NBN. In line with this, the preceding chapters have outlined how the NBN is likely to affect the Australian community and economy.
- 9.2 The terms of reference also required the Committee to examine ‘the optimal capacity and technological requirements of a network to deliver these outcomes’. This has been addressed, to some extent, in each of the preceding chapters. For example, in Chapter 3 on health it is explained that fibre is a pre-requisite for advanced tele-health applications that require symmetric, high-speed, low-latency connections.
- 9.3 This chapter will outline the evidence the Committee received around capacity and technology in more detail without focussing on any particular sector. An overview of the NBN design and roll-out plan, as well as an overview of the various broadband technologies that are used in Australia, is provided at Appendix A.
- 9.4 Through the course of the inquiry there was overwhelming support for the NBN. However, it is fair to say that the majority of contributors did not come to the inquiry from a technical viewpoint. Most were simply in favour of the NBN because it promises to deliver broadband that is fast, reliable, and available everywhere.
- 9.5 The Committee did, however, receive a substantial amount of evidence about technical aspects of the NBN, and, in particular, the benefits of fibre over other broadband technologies. The Department of Broadband, Communications and the Digital Economy (DBCDE) submission suggested that the NBN design has five key definitive characteristics,

which can be summarised as: Speed; Symmetry; Ubiquity; Reliability; and National wholesale arrangements.<sup>1</sup>

## Speed

9.6 The submission of the Australian Information Industry Association (AIIA) commenced with three quotes that demonstrate it is easy to dramatically underestimate how technology will be used in the future:

- I think there is a world market for maybe five computers - *Thomas Watson, Chairman of IBM 1943.*
- There is no reason anyone would want a computer in their home - *Ken Olsen, Present Chairman of and Founder of Digital Equipment Corp, 1977.*
- 640K of RAM ought to be enough for anybody - *Bill Gates, Chairman of Microsoft, 1981.*<sup>2</sup>

9.7 A number of submitters and witnesses made this point to the Committee, including Mr Maha Krishnapillai, Director of Government and Corporate Affairs at Optus:

Historically, predicting the possibilities of the information, communication and technology sector has seen its fair share of mistakes and underestimations ...<sup>3</sup>

9.8 One observable fact about past technology use is that demand for faster broadband has grown relentlessly. This point was made in the submission of National ICT Australia (NICTA):

At no time has demand for bandwidth decreased. In fact, it has increased year on year by 50 per cent per annum.<sup>4</sup>

9.9 Making informed predictions about the future is, of course, a necessary component of planning processes. Most forecasters predict demand for data to continue to increase rapidly into the coming years. Cisco, for example, has predicted that that global internet traffic will quadruple in the five years to 2014.<sup>5</sup>

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1 DBCDE, *Submission 215*, p. 7.

2 AIIA, *Submission 184*, p. 2.

3 *Committee Hansard*, Hobart, 11 March 2011, p. 11.

4 NICTA, *Submission 198*, p. 5.

5 See Cisco, *Visual Networking Index (VNI): Forecast and Methodology 2009-2014*, pp. 1-2.

- 9.10 Dr Dean Economou, Technology Strategist at NICTA, told the Committee's Sydney hearing that there is nothing that would indicate demand for bandwidth will deviate from its upward trajectory:

All we know is that it has never stopped and if I were a betting man, an investor, and I was looking at the curves, I would not be betting on it stopping, I would be betting on it going faster.<sup>6</sup>

## Drivers of demand for speed

- 9.11 As has been highlighted throughout the earlier chapters, it is expected that video content will lead demand for bandwidth in the future. There are video-based applications across all sectors in the economy that can utilise more bandwidth than is currently available to most Australian premises, particularly if the application requires two-way video.

- 9.12 One of the biggest factors in the increasing demand for bandwidth is not just the speed required by the increasing number of advanced applications, but also the speed required to run many applications simultaneously. This point was made in the submission of the Institute for a Broadband Enabled Society (IBES):

It is important to note that many applications ... do not require high bandwidth in singularity. However the National Broadband Network should enable multiple applications to work at the same time, in the same way as we expect the electricity grid to supply power to all appliances in the home.<sup>7</sup>

- 9.13 There are also applications that exist in other parts of the world or that exist only in research laboratories and universities, but which are likely to be deployed more widely in Australia in the future. Dr Economou of NICTA explained how improving video quality is likely to be a significant driver of future bandwidth usage:

At the moment what looks like HD looks really good compared to TV, but in 20 years it will look like a postage stamp and you will say, 'Why did we ever put up with that?' You will say, 'You really need it.' The thing is that technology is making it possible. Samsung screens get 20 per cent cheaper and 20 per cent bigger every year. The Japanese 15 years ago were working on what is called ultra high definition TV, which is 16 times HD ...

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6 *Committee Hansard*, Sydney, 29 April 2011, p. 58.

7 *IBES, Submission 84*, p. 11.

So 16 times is coming and that, even compressed for broadcast, is 200 to 300 megabits [per second]. That is what we can perceive. All I can say in my time in this game and Dr Percival's as well, is that we have never seen demand for bandwidth go down and whenever you try to double guess that it is going to level out it just does not.<sup>8</sup>

- 9.14 Chris Hancock, CEO of AARNet, told the Committee about a high-definition video-conferencing experience requiring gigabits of data transmission per second:

The first [example] is called an OptIPortal ... Just picture one of your computer screens – a Dell or an Apple screen on your desk. It is 24 of those sewn together ...

If you look at an OptIPortal, it has the capacity for each of those small 24 screens to use 1.6 gigabits per second on their own for each screen. So we are talking about a 40 gigabit per second device – gigabits, not megabits ...

We have done linkages, for example, where we have shared health and climate change data between the University of Queensland, the University of Melbourne, Gwangju Institute in Korea and the Texas Institute. They each had OptIPortals and they shared some high-definition visualisations. That pushed the limits at between five to nine gigabits per second.<sup>9</sup>

- 9.15 Mr Hancock went on to describe how these university-based experiences might translate to the home:

The point about that example is that it is a new and innovative service. Why is that important to this debate? We see that the homes of the future are going to have these as walls. That is what we are going to be doing. You will not have the video set from Harvey Norman; you will actually almost have an actual optIPortal in your living room that is bezel-less and is a flat screen ... The question was asked earlier today: will it ever replace being there? Our belief is that it absolutely will, because the technology will allow us to do that.<sup>10</sup>

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8 *Committee Hansard*, Sydney, 29 April 2011, p. 58.

9 *Committee Hansard*, Canberra, 27 May 2011, pp. 26–27.

10 *Committee Hansard*, Canberra, 27 May 2011, p. 27.

- 9.16 The NICTA submission explained that ‘True 3D’ technology is currently being developed and could be a consumer product at some time in the future:

Current ‘3D’ TV is actually stereo TV, meaning only two video channels are used – one for each eye. The 3D effect provides only one viewing perspective. To ensure backwards compatibility the two video streams are encoded into the same bandwidth as a single HDTV stream.

True 3D allows the viewer to move around and see different perspectives, for example being able to look around an object. This can be approximated convincingly by recording 16, 32 or more different perspectives. Such systems would require hundreds of megabits per second to transmit.

The ultimate 3D representation is currently provided by holographic technology. The technology is complex but can provide a continuous view of an object from any perspective. Primitive videos have been demonstrated but the data involved is vast. A one litre volume still image uses hundreds of gigabytes of data.<sup>11</sup>

- 9.17 At the Committee’s Sydney hearing, Dr Economou discussed ‘true 3D’ technology and also noted that::

... 20 years or 30 years from now that may be mainstream and what appears to be trivial or hokey or some kind of child’s toy, like Twitter or something, ends up changing the world.<sup>12</sup>

## Scalable and future-proof technology

- 9.18 A common theme throughout the inquiry was the need to build a network that has capacity for the future – to support the sorts of advanced applications discussed above that may be common in the home before too long. Google Australia’s submission argued that:

Super-fast broadband gives us a platform – like the Trans-Australia Railway did – to connect to a new generation of opportunities. It has almost unlimited potential to deliver innovation in the types of content creation, delivery and consumption models that will be available to Australians.<sup>13</sup>

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11 NICTA, *Submission 198*, p. 3.

12 *Committee Hansard*, Sydney, 29 April 2011, p. 58.

13 Google, *Submission 233*, p. [2].

- 9.19 The proposition of future-proofing through FTTP was advanced by several inquiry participants, including by Professor Paddy Nixon of the University of Tasmania:

... where possible you put in the most future-proof technology you can. That is not always completely feasible. It would be very difficult, for example, to roll a fibre line out into the middle of nowhere in a relatively cost-effective way. But current wisdom would suggest that fibre is the most future-proof of the technologies available to give us the highest bandwidth to a particular point.<sup>14</sup>

- 9.20 NICTA's submission also expressed similar sentiments:

The NBN is designed to last at least 30 years. We should not constrain ourselves to thinking about the applications currently available, but also look at services and applications that can might (and will) be developed in the future. For this reason, the strongest, most robust broadband framework that has the capacity to scale up should be provided.<sup>15</sup>

- 9.21 The Committee was often told about the effectively limitless capacity of fibre. The IBES submission outlined why fibre is the preferred technology:

Work underway at the University of Melbourne has demonstrated that fibre-to-the-premises networks are the most future-proof fixed technology available. The next generations of fixed telecommunications networks will continue to rely on fibre optic cable, however much faster speeds will be achieved by improving the equipment in telephone exchanges, and in the home.<sup>16</sup>

- 9.22 The Communications Alliance submission explained in detail the upgrade path for NBN fibre:

Fibre-to-the-premise[s], using the G-PON architecture being employed by NBN Co, is immensely scalable. The architecture and equipment being used in the initial roll-out effectively shares 2.5 Gbit/s of download capacity between each group of 32 users/premises, giving the capability to provide, in all practical senses, a download speed of 100 Mbit/s to each user and the ability for individuals to burst up to 1 Gbit/s.

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14 *Committee Hansard*, Hobart, 11 March 2011, p. 8.

15 NICTA, *Submission 198*, p. 35.

16 IBES, *Submission 84*, p. 11.



End-equipment technology is already available to boost this download-per-user speed by a factor of four and is likely to be introduced by NBN Co at some stage during its roll-out program. With the incorporation of Wave-Division-Multiplexing (WDM) technology into the network and with the advent of 40 Gbit/s and 100 Gbit/s interfaces currently being trialled, it is likely that the fibre being laid by NBN Co today could eventually deliver download speeds of up to 100 Gbit/s to Australian consumers – all without any upgrade to the physical fibre link.<sup>17</sup>

## Other broadband technologies

9.23 In commenting on the benefits of fibre, a number of contributors also considered the limitations of other current broadband technologies utilised in Australia – ADSL and its variants, HFC, and wireless. DBCDE’s submission argued that:

Once bandwidth requirements move beyond 20-30 Mbit/s, existing technologies such as ADSL and wireless 3G technologies are insufficient. While HFC can support data speed beyond 100 Mbit/s, the cable footprint in Australia is limited to approximately 2.6 million households, and like wireless technology, HFC is a shared technology and performance degrades when users share the available bandwidth in their area.<sup>18</sup>

9.24 Professor Nixon provided a technical explanation about the limitations of non-FTTP fixed line broadband services, including fibre-to-the-node:

You always have this last mile problem. Let’s say you take fibre to two offices from here, but then between the offices and here you put in a very thin line. It does not matter how fast it arrives at the office two doors away, it still has to go through the slower length to get to you. So if you are still providing from the hub to the houses you still have to multiplex over limited copper wires and you will still have exactly the same potential problem – irrespective of how fast it arrives at the hub.<sup>19</sup>

9.25 The DBCDE submission went on to explain the particular speed issues with ADSL technologies:

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17 Communications Alliance, *Submission 185*, p. 20.

18 DBCDE, *Submission 215*, pp. 86–87.

19 *Committee Hansard*, Hobart, 11 March 2011, pp 10–11.

ADSL2+ has a nominal peak download speed of 24 Mbit/s and upload speed of 1 Mbit/s. On average, however, speeds delivered to the end user are considerably below this and is largely dependent on how far the end user is from the telephone exchange ...

The key distinction between DSL technologies and the fibre technology proposed by NBN Co is that the transmission signal within optical fibre does not degrade as rapidly with distance as DSL technology.<sup>20</sup>

9.26 The CSIRO submission also highlighted fundamental speed limitations with HFC and ADSL:

In typical HFC networks, bandwidth to the subscribers is in the range of 50 Mbit/s downstream and 10 Mbit/s (or 30 Mbit/s for DOCSIS2.0) upstream. However this bandwidth is typically shared among 100 to 400 subscribers in the local loop. Competition for available bandwidth may rise during peak times, reducing effective bandwidth to individual subscribers ...

ADSL typically offers 10 Mbit/s downstream and 1 Mbit/s upstream (up to 24 Mbit/s down and 3.3 Mbit/s up for ADSL2+) to individual subscribers without sharing bandwidth with other subscribers. However, ADSL can generally only be distributed over short distances from the switch office, typically less than 4 km, and beyond that its capacity may be reduced.<sup>21</sup>

9.27 Mr Krishnapillai of Optus – one of the largest owners and operators of HFC networks in Australia – outlined the advantages of fibre over HFC:

A HFC network clearly is a shared network. The more people who use it in a particular street, the lower speeds you end up getting. That is different from a fibre network. The second issue is that the physical limitations of HFC as a technology are very different from the almost unlimited potential for pure fibre. Effectively [HFC] is a fibre-to-the-node.<sup>22</sup>

9.28 Aside from fixed line technologies, the other current primary method of providing broadband services in Australia is through '3G' mobile wireless technologies. As outlined at Appendix A and throughout evidence to the inquiry, mobile wireless usage continues to increase rapidly in Australia.

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20 DBCDE, *Submission 215*, p 89.

21 CSIRO, *Submission 171*, p. 18.

22 *Committee Hansard*, Hobart, 11 March 2011, p. 25.

The Committee heard that demand for wireless is expected to continue as the proliferation of mobile devices requiring connectivity intensifies. This process will be assisted by the implementation of next generation LTE wireless networks, which provide significant speed improvements over 3G services.

9.29 The Committee received extensive evidence that despite the increase in demand for mobile wireless connectivity, fixed line networks remain important and will continue to be the primary method by which Australians download data-intensive content. As mentioned in Appendix A, even though wireless now accounts for 40 per cent of all Australian broadband connections, these connections only account for nine per cent of total downloads.

9.30 The central proposition heard in evidence was that wireless and fixed networks are complementary. This position was put forward by the Communications Alliance:

[We] believe that fixed and wireless technologies are complementary and that both will be important components in meeting consumers' communications needs and desires going forward. Increasingly, the emphasis will not be on which network technology is used, but rather whether the device being used is capable of connecting seamlessly to whichever network is the most effective for the consumer at that time, irrespective of their location.<sup>23</sup>

9.31 The IBES submission made a similar point and also highlighted the limitations of wireless:

Wireless technologies are complementary to fixed networks, however it should be recognised that spectrum is a limited resource and [wireless] networks cannot provide the bandwidth of fibre networks.<sup>24</sup>

9.32 Professor Nixon advised the Committee that wireless will always provide inferior speeds to fixed line fibre services:

There are fundamental physics limitations that mean that that is not viable. Communication through the air and communication through light are just different approaches to things and they have certain limitations. So no, there is not likely to be at this stage such a wireless communication [that has the capacity of fibre]. As

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23 Communications Alliance, *Submission 185*, p. 20.

24 IBES, *Submission 84*, p. 11.

wireless gets faster, the technologies that provide down the fibre will also get faster, so there will always be a discontinuity between the speeds available over fibre and the speeds available over wireless.<sup>25</sup>

- 9.33 Mr John McGee of the Tasmanian Department of Economic Development, Tourism and the Arts, and a former radio-frequency design engineer, also told the Committee about the limitations of wireless:

Why is wireless limited? Wireless is limited because of channel allocation. It is a real estate issue in an open, shared environment. ... Deploying wireless as a 100 per cent solution, what do you end up with? You end up with a lot of fibre – you end up fibre to base stations.<sup>26</sup>

- 9.34 A recent research report by IBES demonstrated the problems with using LTE wireless as the sole broadband solution in urban areas. The research found that to allow users to download 50 gigabytes of data in a month in an urban area, there would need to be at least 29 base station towers per square kilometre. To allow 200 gigabytes of data per month would require 51 towers per square kilometre. The report also noted that there would be a large amount of interference caused by having so many towers in a small area. This means that each individual tower is much less capable of delivering a fast speed than it would be in a less densely populated rural area.<sup>27</sup>

## Beyond the NBN fibre footprint

- 9.35 The same IBES research report found that wireless networks work well in less densely populated areas – the sorts of areas that will receive a fixed wireless service under the NBN:

The results demonstrated that fixed wireless networks are a good substitute for fixed cabled networks in rural areas. Users can access a wide range of services and download large amounts of data without overloading the network, while experiencing a good level of performance.<sup>28</sup>

- 9.36 Mr McGee of the Tasmanian Government confirmed that fixed wireless can provide a good service if managed correctly:
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25 *Committee Hansard*, Hobart, 11 March 2011, p. 11.

26 *Committee Hansard*, Hobart, 11 March 2011, p. 73.

27 Institute for a Broadband Enabled Society, *Where Wireless Makes Sense*, June 2011, p. 32.

28 Institute for a Broadband Enabled Society, *Where Wireless Makes Sense*, June 2011, p. 35.

... a relatively high proportion of Tasmanian premises will be connected by wireless ... A well-designed fixed point to multipoint capability is important. It is a capability that is fourth generation, whether it is LTE or WiMAX. The base station capability is a gigabit per second. If the points to multipoints are well managed, the notion of increasing bandwidth in a wireless environment can occur.<sup>29</sup>

- 9.37 Mr Mike Quigley of NBN Co commented on the quality of service that can be expected in areas serviced by an NBN fixed wireless service or an NBN satellite service:

I would also like to put on the record what we have developed for the remaining seven per cent. In fixed wireless – and it is not a mobile service – four per cent; and a satellite service, three per cent. These are radically improved services over what people would be getting today. For example, on the satellite we anticipate launching two large Ka-band satellites – these are six-and-a-half ton satellites each – which will provide 12 megs down, one meg up with what are called average busy-hour throughputs – in other words, how much people can download effectively without congestion of very high dimensioning – much greater than what is available today. People in the bush in the seven per cent will get services that are at least equivalent to what they can typically get in cities on ADSL 2+ today.<sup>30</sup>

- 9.38 He then provided further detail about the design processes that will ensure a high quality fixed wireless service.

We will keep up with the latest technology developments as they take place, and with the potential vendors for that technology – we have already had discussions about what is the evolution path for higher speeds. I would also make the point that you will hear some very large numbers about wireless that say LTE can do 100 megabits per second. It is true. From the centre of a cell with only one person on it, even if you turn off the error correcting coding that goes on you can get high throughputs, but that is not what the engineering is about. The engineering is about what you can provide to everybody at the edge of cells. That is why we have

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29 *Committee Hansard*, Hobart, 11 March 2011, p. 73.

30 *Committee Hansard*, Sydney, 29 April 2011, p. 4.

taken a very conservative engineering approach to dimension for 12 megabits per second at the edge of a cell, not in the centre.<sup>31</sup>

- 9.39 Contributors to the inquiry acknowledged that it is uneconomic to provide FTTP to some areas, and therefore that fixed wireless and satellite become important alternatives. Professor Nixon made this point:

There are places where wireless is an important component of a broadband rollout, maybe for reasons of access because you cannot roll fibre out, or maybe for additional ubiquity ...<sup>32</sup>

- 9.40 The submission of the IT Industry Innovation Council also acknowledged the importance of non-fibre solutions:

The Council's position remains that the speed and capacity of a fibre based network is unquestioned and required, but that given the geographic distribution of Australia's population and the consequent costs of providing fibre access to all, it was always going to include the appropriate wireless technologies to provide ubiquity of access.<sup>33</sup>

- 9.41 The AIIA submission provided further support for the NBN's chosen mix of technologies:

NBN is using the best available combination of technologies. It has not chosen one type of technology, recognising that different population densities dictate the economics of particular technologies. A simplistic comparison to the US 4G initiative is highly inappropriate because the US already has a very high penetration of high speed cable (which we do not) plus a geography with many closely spaced cities. Our geography is very different and requires a technology solution designed for us. Fibre optic, PLUS wireless PLUS satellite will all be required to achieve 100 per cent coverage ... Satellite is and will be the most suitable for delivering broadband to remote communities, and wireless to more densely populated rural communities ...<sup>34</sup>

- 9.42 Another aspect of speed is latency – the delay in data transmission caused by the time it takes for data to get from one designated point to another. Latency is an unavoidable feature of satellite services because of the vast distances involved in a signal travelling between earth and a satellite. The

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31 *Committee Hansard*, Sydney, 29 April 2011, p. 5.

32 *Committee Hansard*, Hobart, 11 March 2011, p. 8.

33 IT Industry Innovation Council, *Submission 111*, p. 12.

34 AIIA, *Submission 184*, p. 26.

Committee heard that latency makes satellite services unsuitable for applications that rely on very low delays, such as remote surgical applications in the health sector.<sup>35</sup> Low latency is another important advantage of fibre over other fixed line networks.

- 9.43 The Committee received evidence from communities that are likely to receive a fixed wireless or satellite service and, in particular, from communities that are going to be located on a fibre backhaul transit route but will not receive a fibre connection.<sup>36</sup> These communities raised concerns about the quality of their prospective services and the divide that will be created between those with fibre services and those without.
- 9.44 Notwithstanding the points made above about the economics of providing fibre to remote locations, and the good service quality that can be expected with the NBN's non-fibre services, NBN Co is trialling a fibre extension program that allows rural communities to pay to have fibre connected. This program is discussed in more detail in Chapter 11.
- 9.45 At the Committee's Sydney hearing, Mike Quigley of NBN Co responded directly to the queries of communities on fibre backhaul routes:

If I can draw a distinction between the fibre that is the access fibre that goes out to every premise[s] and the fibre that is the backhaul, which has aggregated literally thousands of traffic streams onto it. It is possible that people will see a fibre going past which is the backhaul fibre. If I can draw an analogy, it is a bit like a high-speed train rail link. If you have the TGV running past your home, you will say, 'Why isn't it stopping?' The reason it is not stopping is it is going 200 kilometres an hour. We have that same issue where you cannot just break out to drop something off. You can actually break it out, but you need a whole exchange to break it out and connect it up.

I know it is frustrating for people. They see a fibre. They say, 'There it is. It is only over there. Why can't they just drop it in to me?' It is for that very reason; you just cannot do that in an engineering sense. We are trying to make sure people understand that. But in laying out the network to get to 93 per cent of premises with fibre, we have tried to make sure that we have picked up every town in the country with 1000 or more premises; we will

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35 Northern Territory Government, *Submission 209*, p. 7.

36 See, for example, Ms Ally Mercer, Dorset Council, *Committee Hansard*, Launceston, 10 March 2011, p. 6; Get Connected, *Submission 43*; McKinlay Shire Council, *Submission 31*; and Regional Development Australia Townsville and North West Queensland, *Submission 202*.

fibre it. If a town is on one of the backhaul routes and it has more than 500 premises, we will fibre it.<sup>37</sup>

## International backhaul capacity

- 9.46 While the NBN will focus on improving networks within Australia, the ability to link into international networks is also a very important issue. This was identified by the University of Newcastle:

An end user will not experience the benefits of fast broadband in their premises or business if the networks that carry the data between network hubs (commonly known as backhaul) do not have sufficient capacity. This includes inter-region, national and international links.<sup>38</sup>

- 9.47 The Committee heard some concerns that Australia's international backhaul capacity is not sufficient at present. Smartnet, for example, commented:

... we believe that a major weakness of the current NBN program is its lack of recognition that Australia's internet access depends on a handful of international submarine cables, most of which terminate in Sydney. The majority of all current and foreseeable internet traffic travels through these cables, including many of the services that the NBN plans to deliver. There are not enough of these cables and their capacity is limited.<sup>39</sup>

- 9.48 Others noted that international capacity would clearly need to increase over time as the NBN is rolled out, but also noted that adding additional capacity is not especially problematic. Mr Quigley of NBN Co stated:

I think as we see more content being used, particularly video content, there is no doubt that those overseas links are going to have to be increased in size ... I used to work for a company that had some 45 per cent share of the undersea submarine optical system. I can tell you for certain the prices of those systems have plummeted in the last decade or so. Compared with the overall cost of delivering high-speed broadband to end users, the costs of the overseas links are not great. You can upgrade capacities on

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37 *Committee Hansard*, Sydney, 29 April 2011, p. 4.

38 University of Newcastle, *Submission 93*, p. 17.

39 Smartnet, *Submission 134*, p. 7.



overseas links relatively cheaply compared with rolling out a high-speed access network.<sup>40</sup>

- 9.49 Mr Krishnapillai of Optus observed that demand for international capacity has been increasing quickly, but was confident that the private sector would provide additional capacity as it is required:

... the forecasts we put in place for our usage of international capacity were overrun very quickly. We think we know a thing about forecasting but the demand over the last two to three years for data usage internationally has been higher, I think, than anyone really expected in the industry if we are honest about it. Therefore, the need for additional international capacity I think will certainly emerge again in the future, but we do not see that as being an area that certainly requires government intervention. We think there will be solutions in place in years to come that increase that capacity.<sup>41</sup>

## Symmetry

- 9.50 In the past, debates about broadband speeds have been focussed on download speeds. This is because until relatively recently most people's internet usage was one way – viewing web pages, watching videos, and downloading files. The Committee received a large amount of evidence during the inquiry suggesting that there is increasing demand for upload and download speeds that are more equal, commonly referred to as symmetry.
- 9.51 Faster upload speeds are a prerequisite for many of the services discussed earlier in this report. For example, the ability tele-work on multimedia projects is dependent on the capacity to upload large files in a timely fashion. The importance of symmetry was described in a number of submissions, including NICTA's, which also provided a list outlining the drivers of demand for symmetry:
- **Video (on-demand, two-way service)** – Good quality video needs anything from 5 Megabits per second and upwards per channel to stream in one direction.
  - **Cloud services** – ... The network characteristics needed are low delay, high reliability and high bandwidth.

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40 *Committee Hansard*, Sydney, 29 April 2011, p. 3.

41 *Committee Hansard*, Sydney, 29 April 2011, p. 22.

- **The Internet of Things** – Smart transport systems, smart phones, networked cars, smart homes, wireless digital video cameras, sensors and as yet unforeseen devices connected to the Internet will contribute to an increasing base load of ‘machine to machine’ communications ...
- **Facebook** – By the end of June 2011, 100 billion photos had been uploaded to Facebook ... It is probable that this is the beginning of a much larger trend.
- **Peer-to-peer traffic** – by its nature this traffic is symmetrical.
- **Immersive, 3D environments including haptics** – Immersive environments in which the user is literally immersed in an electronically created environment requires many high quality video streams and associated audio.
- **High-quality printing of images** – Professional photographers can generate image files that may be 100 megabytes for a single image.<sup>42</sup>

9.52 Mr Quigley outlined how video is not only a key driver of demand for download speed but also upload speed:

There are a lot of drivers, but overwhelmingly it is video. The world is simply becoming more video oriented ... We are using an increasing amount of video and it is not just about entertainment. It is about video-conferencing. It is about medical imaging. It is about education and remote education. We are seeing the level of resolution of screens increasing. The screen sizes are going up. These are multiplier effects, which all have an impact on the bandwidth that is required. Unlike a normal voice call where you can transmit high-fidelity voice on relatively low bandwidths, you simply cannot do that with video. It is directly proportional to screen sizes and resolution. They are simply increasing regularly.<sup>43</sup>

9.53 A key benefit of fibre is that it can provide a symmetrical broadband connection in a way that other technologies cannot. This point was illustrated in CSIRO’s supplementary submission:

HFC and ADSL are either bandwidth limited (ADSL) or shared medium (HFC) asymmetric technologies, and therefore not suitable for symmetric two-way multimedia applications, such as high quality, high bandwidth two-way video-conferencing applications. Optical fibre access is symmetric by its nature,

42 NICTA, *Submission 198*, pp. 37–38.

43 *Committee Hansard*, Sydney, 29 April 2011, p. 3.

although it can be configured to be asymmetric to some extent if required.<sup>44</sup>

- 9.54 The DBCDE submission illustrated the relative capacities of the available fixed line broadband services, noting that the initial NBN services will still be asymmetric but to a lesser extent than other technologies:

Broadband technologies which are 'asymmetric', such as ... ADSL, have a bandwidth capacity downstream which is greater than its upstream capacity. The optical fibre technology proposed by NBN Co is also asymmetric but not nearly to the same degree. The theoretical upstream capacity of ADSL, for example, is 1 Mbit/s compared with NBN Co's top level fibre service which will be able to deliver up to 400 Mbit/s upstream.<sup>45</sup>

## Ubiquity

- 9.55 Many submitters and witnesses argued that the most important benefit of the NBN is not the speed and scalability of the fibre solution, but that it will make available a good-quality broadband service to all Australian premises. This point was made during the inquiry by, for example, Dr Terry Percival, Director of Broadband and the Digital Economy at NICTA:

There are five important things about the National Broadband Network that I want to raise. Those five things are ubiquity, ubiquity, ubiquity, ubiquity and ubiquity.<sup>46</sup>

- 9.56 The CSIRO submission commented that having access to more people online enables new methods of service delivery for government and industry:

The immediate impact will be to bridge the 'digital divide', supporting greater inclusiveness by making available a guaranteed level of broadband connectivity to all Australians. As a result of being able to reach all, or a greater part, of the population, new forms of service delivery become feasible. Government and industry will have the potential to reach all Australians using current and yet-to-be-developed electronic services. The NBN also has the potential to create the opportunity for all Australians to

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44 CSIRO, *Submission 171.1*, p. 1.

45 DBCDE, *Submission 215*, p. 85.

46 *Committee Hansard*, Sydney, 29 April 2011, p. 56.

generate content, a benefit that will support new businesses and enable greater sharing of information with the broader community.<sup>47</sup>

- 9.57 Mr David Buckingham, the Chief Financial Officer of internet service provider iiNet, described the fundamental change that the NBN's ubiquitous coverage will engender:

When the world knew that all the homes had power sockets, it was able to mass produce electrical appliances. When we know that every home has a grey NBN box attached to the wall, what will start being created? If we have more certainty then our academics, researchers, hackers and businesses will turn their eyes to that vision. As attractive as it might be for us as a company and our customers, the NBN network is not the objective; the potential use is the real objective. For iiNet, the fibre network is an important enabler of improvements in the way personal, commercial and government transactions will drive communications over the next five, 10 or 15 years. It will be intrinsic to our way of life just as electricity is or any other utility that we use.<sup>48</sup>

- 9.58 The Committee heard that there are many applications that benefit more from the ubiquitous availability of the NBN than its fast speed. For example, many health monitoring, environmental monitoring, and 'smart' infrastructure monitoring applications are not data-intensive, but do require a connection that is firstly available, and secondly reliable. There are, of course, great benefits in having a network that is both ubiquitous and fast, because it will enable widespread access to the more advanced applications outlined in earlier chapters.

- 9.59 As described in Chapter 4 on education, the Committee received evidence in Sydney from Mr Gary Ballantyne of Huawei, who commented on how ubiquity could enable students to keep learning in the event of a disaster or epidemic. Mr Ballantyne stressed that ubiquity of participation needs to be the key goal, not just ubiquity of coverage:

A network like the NBN, which has not only got ubiquitous coverage but also ubiquitous participation, would enable that kind of situation to be very effectively dealt with where the kids do not miss out on three weeks of classes and are able to continue their

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47 CSIRO, *Submission 171*, p. 5.

48 *Committee Hansard*, Perth, 5 May 2011, p. 2.

education remotely via the NBN facility. I think that the ubiquity of participation is the key thing.<sup>49</sup>

- 9.60 Issues around encouraging the uptake of broadband services are discussed in Chapter 11.

## Reliability

- 9.61 The NBN represents a once in a generation upgrade of Australia's communications infrastructure. Fixed line services such as DSL and HFC are in many cases relying on infrastructure that is decades old. With the age of the infrastructure comes a degree of unreliability; a point made in the DBCDE submission:

Compared to the ageing copper network infrastructure, the NBN will be more reliable thereby giving households, businesses, and service providers greater confidence to use the network for services and applications which demand a high quality of service.<sup>50</sup>

- 9.62 In Adelaide the Committee heard from Professor Reg Coutts, a telecommunications expert and former Telstra employee, who also commented on issues related to current ageing infrastructure:

... the actual costs of just maintaining the copper infrastructure – not improving it; just maintaining it – are in the order of \$1 billion per annum, although I do not recall the current figures. In certain areas along the coastlines – in Queensland, for example – there are endless problems with the copper. I left Telstra back in 1993, and we were talking in Telstra then about how we were going to replace the copper network with an optical network ...

When people talk about why we are [building the NBN], I remind them that the copper network was built through public expenditure and it was built to support black, bakelite telephones. Yet here it is supporting our broadband. Why will they not let it retire?<sup>51</sup>

- 9.63 The submission of Mr Alun Davies, a former Telstra countrywide employee, highlighted the frailties of the copper network, arguing that

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49 *Committee Hansard*, Sydney, 29 April 2011, p. 14.

50 DBCDE, *Submission 215*, p. 7.

51 *Committee Hansard*, Adelaide, 4 April 2011, p. 45.

‘copper is severely affected by water and lightning, [therefore] requiring constant maintenance’.<sup>52</sup>

9.64 Mr Krishnapillai of Optus commented on the ageing nature of the company’s networks that will be superseded by the NBN’s infrastructure:

... some of the networks that we have developed, such as HFC networks, are 15 years plus old, and they are by their very nature using older technology to deliver those sorts of services.<sup>53</sup>

9.65 The Committee heard that the fibre components of the NBN will provide a robust network with a considerable lifespan. This point was made by NICTA’s Dr Percival in Sydney:

This is a national infrastructure project. You really need to think 30 to 50 years ahead – a 50-year lifetime at least for optical fibre or maybe more. In fact, it is so long that we are not quite sure. I built an optical fibre communication system linking several telescopes and the Australia Radio Telescope at Narrabri in 1986, and they are still chugging away quite happily, so who knows how long they are going to last.<sup>54</sup>

9.66 Mr John McGee of the Tasmanian Government made a similar point to the Committee :

Fibre to an end point is always the endgame. It is a suite of applications and services that will become available once the endgame is achieved. This is an infrastructure setting that has a 30- to 50-year life cycle.<sup>55</sup>

9.67 The result of the new infrastructure roll-out will be a service that is not only faster but also more reliable. The Committee heard that reliability of service is becoming more important as technology is further integrated into daily activities. Reliability is especially important for certain types of services. For example, businesses who have wholly adopted cloud-based storage and application delivery are completely reliant on a constant broadband connectivity. Another example is the various monitoring applications that have been outlined in earlier chapters, which rely on round-the-clock connectivity to be effective.

9.68 The NBN will also provide a more reliable service because contention will be less of an issue than it is on current fixed line and wireless networks.

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52 Mr Alun Davies, *Submission 226*, p. [3].

53 *Committee Hansard*, Sydney, 29 April 2011, p. 23.

54 *Committee Hansard*, Sydney, 29 April 2011, p. 53.

55 *Committee Hansard*, Hobart, 11 March 2011, p. 72.

Professor Paddy Nixon of the University of Tasmania explained where contention becomes a problem:

With the current technologies you have a local exchange and it has a wire to everybody's house and you have to try to provide for – let's say – 10 houses that share one connection or 50 or 1000 houses sharing one connection. Whatever number it is, you have to share the connections out, and depending on how many people are active at a given time you effectively get a smaller share of the wire.<sup>56</sup>

- 9.69 Under the NBN, the majority of premises will be served by a shared 'GPON' fibre architecture. However, because of the high capacity of fibre and the fact that fibre services do not rapidly degrade over short distances, GPON architecture can guarantee each user receives a high minimum speed in the busiest parts of the day – provided that the ISP has purchased sufficient capacity. The NBN's fixed wireless and satellite solutions will also be shared services and therefore subject to contention issues. However, Mike Quigley of NBN Co explained that the dimensioning of these services will ensure a more consistent speed than current ADSL services:

We are designing it to have a lot of capacity. On today's ADSL services, different operators dimension things at different levels, but you could say it is somewhere around what we call the average busy-hour throughput ... Normally ADSL is dimensioned somewhere around 35 up to 70 kilobits per second. We are dimensioning the satellite at 300 kilobits per second and the fixed wireless at 500 kilobits per second. That is the capacity we are building in. If everybody tried to stream high definition video it could not be done. But will they get a very good service? I think the answer is, yes.<sup>57</sup>

- 9.70 The Committee heard particular concerns about the reliability and quality of the satellite service that can be expected, given the often poor experience remote communities have had with satellite in the past. This point was acknowledged by Professor Reg Coutts at the Committee's Adelaide hearing. However, Professor Coutts also expressed confidence that reliable and good quality satellite services are possible:

Unfortunately, Australia has broadly had a poor experience with satellite. I think the experience has, shall we say, not been

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56 *Committee Hansard*, Hobart, 11 March 2011, pp 10–11.

57 *Committee Hansard*, Sydney, 29 April 2011, p. 5.

at international world's best practice due to a whole number of reasons. So when you mention satellite to some people in various states and regions it is like you are somehow suggesting they are going to hand over their first born. They certainly consider it a technology of last resort. At the conference last week I was saying that, in part, that is because the satellite community – that is the suppliers, international suppliers et cetera – do not communicate what they can do ...

NBN Co, are well aware of the background to satellite in Australia to date. In many ways they want to see the satellite service as it is introduced very much as 'satellite gold' – in other words, what satellite could be as opposed to what the previous experience has been.<sup>58</sup>

## National wholesale arrangements

9.71 The Committee heard evidence of the benefits of NBN Co's role as a single national wholesale provider, as well as some concerns.

9.72 There was strong support for NBN Co's wholesale-only role because it avoids the issue of vertical integration – where the wholesale provider also provides retail services, as has been the case with Telstra for many years. A number of submissions highlighted the importance of maintaining the principles of separation so that the mistakes of the past are not repeated. This point was made, for example, in the Optus submission:

The NBN is a critical component in reforming the fixed line telecommunications sector. However, it must stay faithful to the principles of true competition, open access, and transparency with a robust reporting and oversight structure. Compromise on any of these principles risks the failure of the competition and innovation aims of the reform.<sup>59</sup>

9.73 The Committee received evidence that the NBN's commitment to national wholesale pricing for basic services is beneficial to regional areas. The Gold Coast City Council submission argued that 'equality of wholesale pricing of the NBN will help to ensure that the viability of services and applications does not depend on geographical location.'<sup>60</sup>

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58 *Committee Hansard*, Adelaide, 4 April 2011, pp. 43, 45.

59 *Optus, Submission 179*, p. 3.

60 *Gold Coast City Council, Submission 71*, p. 2.



- 9.74 The DBCDE submission similarly proposed that ‘uniform national wholesale pricing ... will allow Retail Service Providers using the NBN to provide all communities in Australia with access to affordable high-speed broadband’.<sup>61</sup>
- 9.75 The submission of the Victorian Government raised concerns about the cross-subsidisation arrangements that are inherent in the national wholesale pricing commitment, suggesting that the plan:
- ... risks additional inefficiencies by employing market distorting financial arrangements, including internal, non transparent cross subsidies (such as universal national wholesale pricing) and through public sector financing at non commercial rates of return.<sup>62</sup>
- 9.76 The Committee also heard concerns about the NBN pricing model whereby Retail Service Providers are charged a \$20 ‘CVC’ charge for every Mbit/s of bandwidth which they require. Internode, for example, argued that this will make faster services prohibitively expensive for most people, and also make it difficult for small ISPs to provide nationwide services. Internode instead suggested raising the per port cost and reducing the CVC charge to \$1 per Mbit/s of bandwidth.<sup>63</sup>
- 9.77 There was general support for NBN Co’s role as a monopoly wholesale provider of a ‘layer two’ access network. This view was expressed by Ms Rosemary Sinclair, Managing Director of the Australian Telecommunications Users Group (ATUG):
- ... we have had some real world experience in terms of infrastructure competition and just how much infrastructure competition you can get in Australia, given the size of the market and the geographic nature of this country. The conclusion that we came to was that to get from copper to fibre into every premises in Australia, which is the outcome that we believe is needed, we need a single infrastructure builder in the local access market.<sup>64</sup>
- 9.78 Other contributors noted the benefits inherent in having a single infrastructure provider. Mr Quigley of NBN Co, for example, argued:
- ... if you had underlying multiple wholesale platforms, an operator who wanted to supply services over here would have to

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61 DBCDE, *Submission 215*, p. 7.

62 Victorian Government, *Submission 234*, p. 13.

63 *Committee Hansard*, Adelaide, 4 April 2011, p. 4.

64 *Committee Hansard*, Sydney, 29 April, p. 39.

interface to that wholesaler. If they wanted to provide services in another part of the country they would have a different set of interfaces to reach customers over there. With one national network at the wholesale level they would just have one set of interfaces to do testing with and make sure their systems can cope with it. This is not an easy job. It is about aligning the two systems together so that they can talk to each other seamlessly, which is what we are aiming to do, such that a retail supplier, for example, iiNet, will from their terminal be able to see our network as if it were their own. In other words, they can test the performance of end-to-end connections without having to ask us. They can do it automatically.<sup>65</sup>

9.79 Mr Quigley expanded on these comments, stating:

If you draw an analogy, it is similar to a rail system. If you have a patchwork of rail systems it clearly does not work as efficiently ... I am not suggesting that the entire telecom network should be one standardised ubiquitous network. But I believe there is an argument for having the lowest level, what is called layer one and layer two, standardised across the fixed line network in the country and then having free and open competition above that. We just will not get two private enterprises building a new fixed line infrastructure. I do not think it will ever happen.<sup>66</sup>

9.80 Mr Krishnapillai of Optus put forward a similar proposition in respect of the need to have a single provider at the basic infrastructure level:

... as we have said many times in the past, we [are] reluctantly accepting that there is a monopoly. Ideally you would want to have multiple different technologies in some ways. You want that competitive dynamic ... We have reluctantly accepted that you need a common standard interface and common standard piece of infrastructure. As long as that is kept down at the, to use the technical term, layer two level, basic roads, and then you have competition at layer three and above, then that will be a good outcome ...<sup>67</sup>

9.81 Mr Krishnapillai also commented on the equity and efficiency benefits inherent in the NBN model:

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65 *Committee Hansard, Sydney, 29 April 2011, p. 7.*

66 *Committee Hansard, Sydney, 29 April 2011, p. 7.*

67 *Committee Hansard, Sydney, 29 April 2011, p. 24.*

You do not have waste or duplicate infrastructure into homes where there are high capacity to pay and then have nothing left over in a broader sense; you have a level playing field for that basic infrastructure.

- 9.82 There were some concerns about NBN Co's monopoly and threats posed to competition in the telecommunications sector. For example, the Victorian Government submission argued:

After over two decades of national economic and financial reform the NBN proposal in its present form represents a very serious threat to the long term competition in the telecommunications sector and an impediment to the most efficient use and allocation of resources and investment ...

Decisions made now could potentially result in unnecessarily higher broadband costs or put in place barriers that hinder infrastructure based wholesale competition to the NBN. This could do long term damage to the development of Australia's broadband market, and create market structures that are difficult if not impossible to unravel.<sup>68</sup>

## Committee conclusions

- 9.83 There is almost universal agreement that Australia's broadband infrastructure is sub-standard at present, and that an upgrade is necessary to enable a thriving digital economy and the ensuing benefits. There are different perspectives on what form the upgrade should take. The Committee's view is that the necessary approach is to extend fibre to as many premises as is practicable, and then to make use of other appropriate technologies in remote areas. This is the approach being pursued through the NBN.
- 9.84 The benefits of fibre over other fixed line broadband technologies are indisputable. The capacity to deliver bandwidth is significantly better and there is an ability to upgrade to much higher speeds as required in the future. Fibre has the capacity to deliver fast download *and* upload speeds – symmetry – in a way that other technologies do not.
- 9.85 The dominant fixed line technologies in Australia – ADSL and its variants and HFC – rely on ageing copper lines for the 'last mile' connection to the

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68 Victorian Government, *Submission 234*, p. 10, 13.

premises. The Committee heard that the capacity of copper to transmit data is inferior to fibre, and that speeds delivered by copper-based networks are acutely affected by contention and distance from the exchange. The Committee also heard that the age of the copper network has an ongoing impact on the reliability of services that can be delivered.

- 9.86 Mobile wireless technologies have become an important way for Australians to connect to the internet and this will certainly continue in the future. However, like copper-based networks, contention issues mean that mobile wireless networks are not capable of delivering the reliability and speed necessary to run high-bandwidth applications, particularly in urban areas. For this reason, mobile wireless networks will always be considered as complementary to fixed line services.
- 9.87 The earlier chapters in this report outlined the evidence the inquiry received about current and potential future uses of broadband. Many of the advanced applications discussed rely on a symmetric high-speed connection. The Committee's view is that there is not an 'optimal capacity' required to support these uses – particularly as all evidence suggests that the required capacity will continue to increase. This will be primarily driven by the need to run many applications within premises simultaneously, and by the ongoing increase in the use of video and its quality. The uses for high quality video are not just in entertainment – there are important applications in all of the sectors discussed in earlier chapters.
- 9.88 While there is not an 'optimal capacity', fibre is undoubtedly the 'optimal' technology because evidence suggests it will be able to support increasing demand for bandwidth over a long period. The Committee was reminded during the inquiry that this is an infrastructure project with a lifespan of 30 to 50 years, possibly longer.
- 9.89 In providing universal broadband coverage in a country as large as Australia, it is impractical to deliver a strand of fibre to every premises in remote areas. NBN Co has committed to providing broadband to seven per cent of the Australian population using a mix of fixed wireless and satellite technologies. While fixed wireless and satellite networks do not have the capacity of FTTP networks, the Committee was assured that remote areas would still receive a good quality service that is considerably better than what is received today. NBN Co told the Committee that it is trialling a fibre extension program whereby local councils and other organisations can pay to have fibre extended to premises that would otherwise be receiving wireless or satellite. This is discussed in more detail in Chapter 11.

- 9.90 Moving away from the debate about technology, ubiquity of coverage is clearly a very important goal to be achieved. The NBN will for the first time make a broadband connection possible for every Australian premises. The Committee heard that having a ubiquitous network will enable new methods of service delivery for business and government and will encourage innovation. The important point was made that the while ubiquity of coverage is an important goal, ubiquity of access is an even more important goal. Issues around encouraging uptake are discussed in Chapter 11.
- 9.91 Given the terms of reference, the Committee has not sought to explore governance and pricing issues in great detail. Nonetheless, these were identified as important issues during the inquiry relevant to the broader NBN debate. The Committee supports the structural separation of Telstra and NBN Co's role a wholesale-only provider. There are obvious benefits in having a single provider at the access network layer and then open retail competition above that. This structure is particularly important for regional Australia as it will provide a level of broadband infrastructure that would not be economic for a private company to provide. Also important to regional areas is the commitment to national wholesale pricing. The Committee agrees that this would not occur if left to the market.
- 9.92 The Committee notes the evidence received in relation to NBN Co's pricing model. Affordability is clearly one of the factors that will affect the uptake of broadband services. It will be important for the Government and NBN Co to ensure that base-level services are affordable for as many Australians as possible, while at the same time ensuring that the wholesale pricing of high-bandwidth plans is not at a level that discourages the development and uptake of advanced broadband applications – the sorts of applications which are the long-term justification for building a national FTTP network.



## Government coordination

- 10.1 To date, much of Australia's public debate around the NBN has focussed on relatively narrow issues such as pricing structures, technology options and governance issues. During the inquiry, the Committee perceived a growing appetite for a broader public discourse around what benefits the NBN could enable across Australia's economy and society. These benefits were discussed in detail in Part One of this report.
- 10.2 This chapter will examine the leadership role that governments need to play in helping to realise these benefits and making sure they are maximised. More specific measures in relation to this will be discussed in the following chapter.

### **A national digital economy strategy**

- 10.3 A recent report by the Broadband Commission for Digital Development called for top-level political leadership and 'trans-sectoral' coordination of broadband projects. The report stated:

When a trans-sectoral approach is taken – that shares infrastructure and builds synergies among the applications that use it – investments can yield major multiplier effects that benefit healthcare, education, energy efficiency, environmental protection, public safety, civic participation and economic growth. Such a trans-sectoral approach should lead to the development of smart interconnected and sustainable communities, homes and businesses.<sup>1</sup>

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1 Broadband Commission for Digital Development, *Broadband: A Platform for Progress*, June 2011, p. 2.

- 10.4 A key message the Committee received during the inquiry was that while the NBN will be enabling infrastructure for a range of social and economic benefits across all sectors, it only addresses the 'supply side' of the equation. In order for the potential of the NBN to be maximised, further action on the 'demand side' will need to be taken. Professor Reg Coutts, Managing Director of Coutts Communications, told the Committee:

There are a number of areas in what I would call the demand side that really warrant attention. I am not saying where that should be coming from – specific departments – but it concerns me that if we focus too much just on the supply side we will not be taking the best advantage [of the NBN].<sup>2</sup>

- 10.5 Similarly, the Department of Human Services (DHS) submitted that:

... there is an inherent risk involved in focussing too heavily on the supply side issues of the digital divide, at the cost of addressing more complex 'demand side' (social and economic) barriers such as low income, and a lack of technological skills and support.<sup>3</sup>

- 10.6 Related to these points, several inquiry participants told the Committee that an overarching strategy is needed in order to outline the Government's goals for how the NBN should be used and how those goals can be delivered through demand side interventions. For example, Communications Alliance supported in its submission the creation of a 'digital roadmap' to coordinate 'the actions of all arms and all layers of Government' in relation to the long term development of Australia's digital economy.<sup>4</sup> Mr John Stanton, Chief Executive Officer of Communications Alliance, told the Committee:

It is crucial that government really get its act together in terms of having this sort of national strategy and working to deliver services, which will in turn drive the development of other applications.<sup>5</sup>

- 10.7 Mr David Buckingham, Chief Financial Officer of iiNet, argued that a national online or digital economy strategy is required to identify the goals of the NBN and change the focus of public debate:

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2 *Committee Hansard*, Adelaide, 4 April 2011, p. 39.

3 DHS, *Submission 186*, p. 10.

4 Communications Alliance, *Submission 185*, p. 11.

5 *Committee Hansard*, Sydney, 29 April 2011, p. 30.



We would like to see the debate switching fast to fundamental questions like: where does Australia wish to be in a global digital economy or does Australia want to create jobs, improve domestic productivity, increase exports and advance its competitive position in a global digital economy? iiNet is a strong supporter of the NBN, but we are also of the opinion that a national online strategy should be a matter of priority and it should be developed in order to give the NBN, government agencies and the economy at large transparency, purpose and direction.<sup>6</sup>

- 10.8 The Committee also heard from inquiry participants that the Government needs to ensure appropriate regulatory frameworks are in place to support the connectivity provided by the NBN. For example, Ms Rosemary Sinclair, Managing Director of the Australian Telecommunications Users Group (ATUG), told the Committee that while broadband connectivity offers significant opportunities for e-health provision, its utilisation has been limited due to an absence of Medicare mechanisms for reimbursing doctors for e-delivered services:

That is the sort of thing that has really got to be thought through: what other levers need to be pulled or buttons pressed to enable systems to change to take advantage of National Broadband Network connectivity.<sup>7</sup>

- 10.9 On 31 May 2011 (after the above contributions had been received), the Minister for Broadband, Communications and the Digital Economy released the *National Digital Economy Strategy*.<sup>8</sup> The Strategy expressed the Government's aim that 'by 2020, Australia will be one the world's leading digital economies' and set eight Digital Economy Goals, focusing on:

- online participation by Australian households;
  - online engagement by Australian businesses and not-for-profit organisations;
  - smart management of our environment and infrastructure;
  - improved health and aged care;
  - expanded online education;
  - increased tele-working;
  - improved online government service delivery and engagement;
- and

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6 *Committee Hansard*, Perth, 5 May 2011, p. 2.

7 *Committee Hansard*, Sydney, 29 April 2011, p. 42.

8 Senator the Hon Stephen Conroy, 'Australia to become a leading digital economy by 2020', *Media Release*, 31 May 2011.

- greater digital engagement in regional Australia.<sup>9</sup>
- 10.10 A range of government initiatives are associated with each of the goals in the Strategy, including tele-health and tele-education trials, programs to help develop digital skills amongst members of the public, and a support program for businesses and not-for-profit organisations in the first NBN rollout sites.<sup>10</sup> Recent changes to the Medicare Benefits Schedule to support tele-health services are also noted in the Strategy. The Committee heard that a group is being set up by the Department of Prime Minister and Cabinet in order to take the Strategy forward on a ‘whole-of-government’ level.<sup>11</sup>
- 10.11 The Committee welcomes the *National Digital Economy Strategy* and the cross-government approach that is being taken to its implementation. The strategy goes a long way to addressing concerns raised during the inquiry about the Government’s strategic direction on digital economy matters. The Committee also welcomes the new government initiatives that are associated with the Strategy, although it notes that most of the programs are focussed on the NBN fibre first release sites. The Committee considers that further government action will be required on a broader scale throughout the NBN rollout to achieve the goals that have been identified in the Strategy.

### Recommendation 1

**That the Government continue to coordinate the implementation of the *National Digital Economy Strategy* across government, ensuring appropriate regulatory frameworks are in place and promoting a consistent trans-sector approach to supporting its goals.**

- 10.12 The Committee acknowledges that ongoing monitoring and reporting will be required in order to measure the progress of the *National Digital Economy Strategy*. The Committee considers that the Government should report against the Strategy on at least an annual basis. Reports should provide up to date information on the progress made and any new initiatives in relation to the eight goals identified in the Strategy.

9 Department of Broadband, Communications and the Digital Economy (DBCDE), *National Digital Economy Strategy*, May 2011, p. 2.

10 DBCDE, *National Digital Economy Strategy*, May 2011, pp. 15–18.

11 Mr Abul Rizvi, Acting Secretary, Department of Broadband, Communications and the Digital Economy, *Committee Hansard*, Canberra, 27 May 2011, p. 57.

- 10.13 Given the leadership role of the Government across all sectors, the Committee considers that an appropriate way to achieve this would be for government departments to report on their progress against the Strategy's goals, where applicable, in their annual reports.

## Recommendation 2

**That the Government require its departments to report against the goals identified in the *National Digital Economy Strategy* in their annual reports.**

## Leading by example

- 10.14 Chapter 2 of this report discussed the potential for the NBN to improve e-government services and enable efficiencies in government operations. The Committee also heard that the development of e-government services can play a key role in encouraging NBN uptake and improving digital literacy.
- 10.15 Dr Tim Williams, a consultant for Huawei, told the Committee that NBN uptake will not occur on its own and spoke of the importance of government setting an example:

... [uptake] is not automatically going to happen as a consequence of just providing a highway. It is really about trying to make sure that at least what is under public control, either at central or local government, really understands what [the NBN] can do to services that they deliver.<sup>12</sup>

- 10.16 Several contributors used Korea as an example of leadership in using broadband in government services and operations. Dr Dean Economou, Technology Strategist at NICTA, described the Korean Government's policy on training for public sector staff:

... the Government mandates that when you do a course, part of that course has to be done over video because the Government, by doing that when it trains its workforce, can take the load off the traffic system. Also it means that they start to understand how to

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12 Committee Hansard, Sydney, 29 April 2011, p. 13.

do the video-conferencing first and so on, so in a sense government is an anchor tenant for some of those applications. That then means that there is a cohort of people with experience and the Korean Government then measures what the effect was.<sup>13</sup>

10.17 The Communications Alliance also cited the excellent e-government leadership of Korea, and provided a number of supporting examples:

- Korea ranks first in the various UN indices for e-government readiness and e-government participation, with more than half the population making regular use of e-government services (projected to top 60 per cent by 2012).
- More than 2500 Korean Government services can be applied for online, and more than 2000 Government forms can be issued online.
- More than 81 per cent of all tax filing is processed online, with enormous savings in bureaucratic effort.
- Officials claim that the transparency inherent in national e-procurement programs has all but eradicated corruption from the awarding of government contracts, saves 4.5 trillion Korean won [AUD 4 billion] per annum in administration costs and has reduced bidding times from half a day down to one minute.
- Similarly, the Korean e-Customs system has cut export declaration processing times from more than a day down to less than 2 minutes and saves 2.5 trillion won [AUD 2.2 billion] per annum.<sup>14</sup>

10.18 The Alliance argued that the strong focus on providing innovative e-government services in Korea has been a key driver of broadband uptake. The Korean example was contrasted with Japan, which has ubiquitous access to fast broadband, but much less pervasive e-government services:

In Japan, approximately 46 per cent of local governments and public organisations are providing some form of e-Government services today, but this is heavily skewed by the fact that 28 per cent of these have some form of online disaster prevention/notification services.

Only 6.6 per cent of local governments, for example, are providing any online welfare services, and the corresponding figures are 5.5 per cent for medical services, 4.3 per cent for education services,

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13 *Committee Hansard*, Sydney, 29 April 2011, p. 59.

14 *Communications Alliance, Submission 185*, p. 12.

5.6 per cent for tourism services and 6.7 per cent for transport services.<sup>15</sup>

- 10.19 The submission went on to link the lack of e-government services in Japan and relatively low rates of broadband take up:

While the Japanese Government is now undertaking a concerted effort to lift its performance in e-government service provision, the lacklustre performance to date is a core reason why in a nation where virtually 100 per cent of the population has access to broadband speeds of 30 Mbit/s or higher, only about 30 per cent of the Japanese population actually use the internet.<sup>16</sup>

- 10.20 The Federal Government, through AGIMO and DBCDE, has an important leadership role in ensuring that government organisations at all levels continue to improve the way technology is utilised and are prepared for the full deployment of the NBN. The evidence provided contrasting the Korean and Japanese experiences demonstrates to the Committee that innovative e-government services can play an important role in promoting broadband use and encouraging uptake.

- 10.21 The Committee considers that part of the Government's leadership role in promoting the development of the digital economy and the utilisation of the NBN is to demonstrate the NBN's potential in its own operations. The Committee therefore encourages the Federal Government to continue to implement broadband-enabled practices into its internal operations and its service delivery programs. This could include practices such as encouraging tele-working arrangements for staff, increasing the use of video-conferencing for meetings, and developing new ways to interact with clients.

### Recommendation 3

**That the Government continues to implement broadband-enabled technologies into its own services and operations as a means of improving efficiency, as well as to encourage NBN uptake and utilisation.**

15 Communications Alliance, *Submission 185*, p. 13.

16 Communications Alliance, *Submission 185*, p. 13.

10.22 The Committee also heard throughout the inquiry that the Federal Government can provide leadership and stimulate demand by supporting pilot projects that demonstrate the possibilities of new broadband applications to industry and the community. For example, the Victorian Government, drawing on its own experience with broadband-based pilot projects, submitted that such projects can help reduce the risks faced by industry and provide lessons for future commercial projects:

Early adopters and ‘broadband pioneers’ face great uncertainties and bear high risks. A pilot project approach can provide the opportunity to investigate the business case for broader deployment with minimal exposure of the business to risks, and to enable ‘learning by doing’.<sup>17</sup>

10.23 The Australian College of Physicians (RACP) provided the Committee with information on how such projects could help improve outcomes in the area of tele-health. It noted that pilot programs would ‘assist in encouraging the adoption of tele-health among clinicians and in building up trust among clinicians and the community generally’. The outcomes of pilot programs ‘would be of assistance in refining the general implementation of tele-health’.<sup>18</sup>

10.24 The Committee notes that the Federal Government has already supported a number of pilot projects that are intended to achieve these aims. The *National Digital Economy Strategy* outlines the following programs:

- ⇒ An ‘NBN-enabled tele-education project’ in Armidale;
- ⇒ An ‘NBN-enabled education and skills services’ program in first release sites;
- ⇒ Tele-health trials in Armidale, Kiama, and Townsville; and
- ⇒ The ‘Smart Grid, Smart City’ initiative in the Newcastle/Hunter region.<sup>19</sup>

10.25 The Committee welcomes these initiatives, and considers that there will be further scope for new pilot projects in strategically targeted areas as the NBN rollout continues.

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17 Victorian Government, *Submission 234*, p. 14.

18 RACP, *Submission 58*, p. 1.

19 DBCDE, *National Digital Economy Strategy*, May 2011.

## Recommendation 4

**That the Government continue to support strategically targeted pilot projects in cooperation with relevant industries and communities that model innovative applications of the NBN.**

## Regional development

- 10.26 As identified extensively in Part One of this report, the NBN's impact is likely to be felt most in areas beyond major cities – areas where access to services, employment and business opportunities can be most challenging. For example, the Committee heard that the NBN will enable access to medical specialists that would not currently be possible without a trip to a major city. The Committee also heard about the capacity of the NBN to aid regional economic development by allowing individuals and businesses to remain or locate in regional areas without losing contact with major population centres.
- 10.27 The Committee's view is that one of the keys to realising the potential benefits of the NBN in these areas will be leadership at the local level. It is clearly important, as the Government has done recently, to establish a national strategy and national goals to provide high-level leadership to the digital economy. However, the achievement of these national goals needs to be driven by grassroots leadership in regional areas.
- 10.28 Through the course of the inquiry the Committee received evidence from a number of regions where strong local leadership on digital economy issues is already providing demonstrable benefits. One such region is Ballarat in Victoria. As outlined in the submission of Ballarat ICT Limited (a Council funded organisation providing regional leadership for the ICT industry), Ballarat has transformed its economy in recent decades:

Ballarat has traditionally been a city that prospered on mineral and agricultural based resources, however this has changed ... Ballarat continues to positively contribute to Victoria's strong growth in the ICT industry. The information technology sector is emerging as a significant industry within the region. Strategic partnerships with the locally growing ICT sector and tertiary

institutions are adding to Ballarat's increasing importance as a knowledge centre within Victoria.<sup>20</sup>

- 10.29 The submission also explained that the region's continually developing ICT industry is underpinned by the 'Ballarat ICT 2030' strategy, which 'provides a framework from which to develop ICT capacity, investment and employment opportunities.'<sup>21</sup>
- 10.30 The Committee held a hearing in Ballarat during which it heard from the Ballarat City Council, the University of Ballarat's Centre for eCommerce and Communications, Ballarat ICT Limited, the Grampians Rural Health Alliance, and Lateral Plains Pty Ltd (a local ICT company). Each of these groups had been intimately involved in the development of Ballarat's ICT Strategy and it was evident that they each shared a strong sense of common purpose for the development of the region's ICT industry. In the Committee's view, Ballarat provides a good example of the local leadership needed across the nation.
- 10.31 Another good example of local leadership is the City of Prospect in Adelaide. The City has also developed a local digital economy strategy, *Future Prospect*, which in October 2010 was awarded Economic Development Australia's national award for the best economic development strategy<sup>22</sup>. The City's submission identifies how taking a strategic approach to digital economy issues has put it in a strong position to take advantage of the NBN:

Through our piloting of programs and projects that make up our Digital Economy Strategy we have practical runs on the board and grassroots experiences that clearly demonstrate the enabling power of the NBN to deliver to local communities and local businesses social and economic benefits.<sup>23</sup>

- 10.32 To bring about this kind of strategic approach to the NBN and the digital economy across the nation, the Committee considers there is a key role for Regional Development Australia committees (RDAs). This role should involve providing local digital economy leadership by encouraging and coordinating the development of regional digital economy strategies.

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20 Ballarat ICT Limited, *Submission 63*, p. [3].

21 Ballarat ICT Limited, *Submission 63*, p. [3].

22 City of Prospect, *Submission 50*, p. [2].

23 City of Prospect, *Submission 50*, p. [1].



**Recommendation 5**

**That the Government consider allocating resources to each Regional Development Australia committee to allow these bodies to provide enhanced local digital economy leadership. This leadership role should include identifying regional goals and implementing related strategies and programs.**



## Encouraging uptake and developing skills

- 11.1 The previous chapter discussed the need for government leadership and coordination in the development of Australia's digital economy, and noted that 'demand-side' interventions will be required to maximise the NBN's potential benefits. This chapter will look at some of the interventions that may be required in more detail.
- 11.2 Adult Learning Australia (ALA) provided the Committee with a useful way to characterise the measures needed to enable the transition to a digital economy:
- Connectivity;
  - Content; and
  - Capability.<sup>1</sup>
- 11.3 While ALA's model was put forward in relation to education, the Committee considers that the 'three Cs' apply more broadly. Without ensuring uptake of connections, encouraging digital content development, and building consumer capabilities, wholesale infrastructure alone will not achieve the NBN's potential. This chapter will look at a range of measures that could be introduced to address each of these elements.

### Promoting ubiquitous connectivity

- 11.4 The Australian Communications Consumer Action Network (ACCAN) told the Committee that:

Most of the potential benefits of high-speed broadband in the delivery of health, education and other government services can

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<sup>1</sup> ALA, *Submission 163*, p. [3].

only be achieved if the network is truly ubiquitous and connects the vast majority of premises nation-wide.<sup>2</sup>

- 11.5 National ICT Australia (NICTA) informed the Committee about Metcalfe's Law, which states that the more people that are connected to a network, the more useful that network will be.<sup>3</sup> Dr Terry Percival, Director of Broadband and the Digital Economy at NICTA, pointed out that having an 'isolated pocket' of connected premises will not have the same benefit as a much larger, ubiquitous network.<sup>4</sup>
- 11.6 The Committee agrees that ubiquity of high speed connectivity is essential in order lift the level of services provided over the network. As discussed in Chapter 2, the potential quality of online services provided by governments across a range of sectors is currently limited because many people, particularly in rural and regional areas, have limited or no broadband access. This problem was described by Adult Learning Australia (ALA ) as a 'lowest common denominator approach'.<sup>5</sup>
- 11.7 While the government's investment in the NBN will clearly increase the availability of high speed broadband connections, the Committee heard that action needs to be taken to ensure that as many premises as possible are connected to the NBN's physical network infrastructure, as many occupants as possible elect to take up the paid retail NBN services available to them, and that to the greatest extent possible people from disadvantaged backgrounds are able to access NBN connections.

### Opt-in or opt-out?

- 11.8 All premises within the NBN's fibre footprint are able to have fibre physically connected free of charge to the owner during the rollout. Once connected, occupants may choose whether or not they wish to pay for retail broadband services to be provided over that connection.
- 11.9 The view put to the Committee was almost universally that connections should be 'opt-out' during the NBN rollout.<sup>6</sup> This would mean that

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2 ACCAN, *Submission 128*, p. 4.

3 NICTA, *Submission 198*, p. 32.

4 *Committee Hansard*, Sydney, 19 April 2011, p. 59.

5 ALA, *Submission 163*, p. [1].

6 For example, see ACCAN, *Submission 128*, p. 4; Eastern Regional Libraries Corporation (ERLC), *Submission 221*, p. [2]; Mrs Sue Farnell, Secretary, North East Tasmania Chamber of Commerce, *Committee Hansard*, Launceston, 10 March 2011, p. 11–12; Mr Tom Laing, Secretary, Willunga Business and Tourism Association, *Committee Hansard*, Victor Harbor, 5 April 2011, p. 55; Mr John Stanton, Chief Executive Officer, Communications Alliance, *Committee Hansard*, Sydney, 29 April 2011, p. 32.

premises are connected with an Optical Network Termination (ONT) unit by default, unless the building owners specifically ask to be excluded from the network.

- 11.10 In the initial NBN trial sites in Tasmania and on the mainland, an 'opt-in' approach has been taken. The Committee heard that for a number of reasons this has resulted in fewer premises being connected than would otherwise have been the case. For example, at its public hearing in Launceston, the Committee heard that the take-up rate in Scottsdale, one of the first three Tasmanian rollout sites, was just under 70 per cent.<sup>7</sup> Opt-out legislation has since been introduced in Tasmania by the state government.<sup>8</sup>
- 11.11 Reasons identified by inquiry participants for lower rates of connection in NBN trial areas include:
- Lack of consumer education about what was being signed up for;<sup>9</sup>
  - Lack of consumer understanding about the benefits of connecting and concerns about damage to lawns;<sup>10</sup>
  - Difficulty contacting absentee landlords;<sup>11</sup>
  - Lack of interest amongst landlords of business premises;<sup>12</sup>
- 11.12 Mr Tom Laing, Secretary of the Willunga Business and Tourism Association, told the Committee that given the universality of applications, an opt-out policy would be better than opt-in. He described fibre as 'the new telecommunications vehicle' to replace ageing copper infrastructure, and argued that 'every household and business needs to be connected'.<sup>13</sup>
- 11.13 Mr Stanton of Communications Alliance also submitted that an opt-out policy 'makes more sense', particularly in regards to the speed and efficiency of the rollout. He noted that an NBN fibre connection does not

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7 Ms Ally Mercer, Sustainable Development Manager, Dorset Council, *Committee Hansard*, Launceston, 10 March 2011, p. 2.

8 Mr Robert Wallace, Chief Executive Officer, Tasmanian Chamber of Commerce and Industry, *Committee Hansard*, 11 March 2011, p. 16.

9 Mr Wallace, *Committee Hansard*, Hobart, 11 March 2011, p. 16.

10 Mr Chris Quigley, Director, Strategic and Commercial Services, Kiama Municipal Council, *Committee Hansard*, Wollongong, 28 April 2011, p. 46.

11 Ms Natalie Burroughs, Chief Executive Officer, Regional Development Australia (RDA) Illawarra, *Committee Hansard*, Wollongong, 28 April 2011, p. 26.

12 Mrs Sue Farnell, Secretary, North East Tasmania Chamber of Commerce, *Committee Hansard*, Launceston, 10 March 2011, p. 11-12, 13-14.

13 *Committee Hansard*, Victor Harbor, 5 April 2011, p. 55.

‘impose on anybody a requirement to take service’, and provided the following analogy:

If your street was being kerbed and guttered for the first time and you did not happen to own a car, you would probably still want a dent in the kerbing that would enable you to have a driveway later on when you did buy a car.<sup>14</sup>

## Engaging with consumers

- 11.14 In terms of the proportion of building occupants in NBN trial areas who had taken up a paid retail broadband service, the Committee heard that the take up rate in Tasmania was around 15 per cent.<sup>15</sup> Although the Committee was informed that these initial Tasmanian take-up rates were actually higher than was assumed in the NBN Implementation study,<sup>16</sup> it considers that the rates could have been substantially higher. The Committee received a wide range of evidence suggesting that increased consumer engagement is the key to driving increased uptake of services.
- 11.15 Inquiry participants expressed diverse views about how this community engagement should take place and who should be responsible for it. Mr Matthew Dunstan, General Manager of Retail at iiNet, told the Committee that while retail service providers (RSPs) will have a role in the future to promote NBN products, broader work is required now to ‘build the brand’ and educate consumers about the ‘what, how and why of the NBN’.<sup>17</sup> Mr Mike Quigley told the Committee that in response to lessons learned in the pre-release rollout sites, NBN Co, within the limits of its wholesale-only mandate, is increasing its efforts in communication with the public.<sup>18</sup>
- 11.16 The majority of inquiry participants agreed that, as the main investor in the NBN, the Federal Government has a lead role to play in educating people about and promoting the benefits of the NBN.<sup>19</sup> However, many

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14 John Stanton, Communications Alliance, *Committee Hansard*, Sydney, 29 April 2011, p. 32.

15 *Committee Hansard*, Launceston, 10 March 2011, p. 27.

16 Ms Pip Spence, First Assistant Secretary, NBN Implementation Division, DBCDE, *Committee Hansard*, Canberra, 27 May 2011, p. 53.

17 *Committee Hansard*, Perth, 5 May 2011, p. 8.

18 *Committee Hansard*, Sydney, 29 April 2011, pp. 1-3.

19 For example, Mr John Grant, Chair, IT Industry Innovation Council (ITIIC), *Committee Hansard*, Brisbane, 18 April 2011, p. 34; Mr Adam Redman, Manager, Government Relations and Policy, Australian Computer Society (ACS), *Committee Hansard*, Brisbane, 18 April 2011, p. 79; Mr Paul Nicholls, Director, Strategic Projects, Office of Research and Development, Curtin University, *Committee Hansard*, Perth, 5 May 2011, p. 26.

participants also suggested that a collaborative approach is required. For example, Communications Alliance suggested a wide-ranging and well-funded information campaign, similar to the digital television switchover campaign, except one that is 'industry led rather than bureaucracy led'.<sup>20</sup> The Tasmanian Chamber of Commerce and Industry and the Tasmanian Farmers and Graziers Association both told the Committee they have been engaged by the state government to promote the NBN to business.<sup>21</sup>

- 11.17 Mr Mills of the South Australian Government's NBN Taskforce suggested that local councils, state governments, NBN Co and the Federal Government all have a role to play in a 'national plus neighbourhood' approach to implementing programs:

In some senses we see that some of that should be council led more so than state led, because each community is quite different, so it is having that local approach with us in support. In a sense we see ourselves, along with NBN, in a supporting role more than a lead role. We have the Commonwealth government. It is a Commonwealth government program so we are expecting them to lead. We expect the NBN Co to get out there and start talking, and we will support them in that space. So it is a mixture of those four.<sup>22</sup>

- 11.18 Mr Bob Carmichael, Manager of Business and Economic Development at the City of Tea Tree Gully, told the Committee that a local information and engagement strategy needs to be developed to 'explain the infrastructure and the benefits of digital services' to his community.<sup>23</sup> He indicated that the council is looking to support an engagement strategy developed by the Federal Government rather than developing one of their own, because it is 'their network'.<sup>24</sup>

- 11.19 The Remote Area Planning and Development Board (RAPAD), a regional economic development agency and regional organisation of councils based in Central West Queensland, submitted that collaboration with local councils is crucial:

Local Government is the first level of government service delivery in the community. For such an important national project as the

20 *Committee Hansard*, Sydney, 29 April 2011, p. 33; *Submission 185*, p. 19.

21 Mr Wallace, *Committee Hansard*, Hobart, 11 March 2011, pp. 19–23; Ms Melinda King, Research Officer, Tasmanian Farmers and Graziers Association, *Committee Hansard*, Launceston, 10 March 2011, p. 42.

22 *Committee Hansard*, Adelaide, 4 April 2011, pp. 56–57, 60.

23 *Committee Hansard*, Adelaide, 4 April 2011, p. 26.

24 *Committee Hansard*, Adelaide, 4 April 2011, p. 31.

NBN the Australian Government should consider greater collaboration with remote and rural Councils.<sup>25</sup>

- 11.20 The Committee recognises that Regional Development Australia (RDA) committees could also play an important role in facilitating local community engagement. For example, Mr Graeme Maxwell, Manager of the City of Victor Harbor, told the Committee that the City is approaching the NBN implementation on a regional basis, collaborating with other councils in the area and working under the 'driving force' of the local RDA.<sup>26</sup>
- 11.21 The Consumer e-Health Alliance (CeHA) advised that 'how to most effectively engage with the community' and have it involved in the development, acceptance and implementation of policy is the 'challenge of the times'. CeHA informed the Committee about the recent establishment of a Ministerial Advisory Council to coordinate the Government's investments in regional projects through RDAs, and suggests that a similar model be used to assist with the implementation of the NBN:
- This Advisory Council is to assist in the co-operation and coordination of the work of 55 RDA committees established across all States and Territories, so that their projects can maximise the benefits for all. We recommend that the key role of NBN in this and other needs across the nation require a similar governance structure so that local needs can be better identified and appropriate NBN support can be positioned in harmony with them and with Health and Education systems.<sup>27</sup>
- 11.22 The Committee received a wide range of suggestions about how this type of consumer engagement could take place. For example, Mr Carmichael was among a number of inquiry participants who suggested that demonstration sites should be set up to promote the benefits of the NBN.<sup>28</sup>
- 11.23 During the course of the inquiry, the Committee was shown demonstrations of broadband applications at the Institute for a Broadband Enabled Society (IBES), Fetch TV, NICTA, Google Australia, and the Telstra Experience Centre. It was also shown examples of fibre infrastructure installed at various sites around Scottsdale. The Committee recognises the impact that being able to see and touch these type of technologies can have in improving consumer understanding of the

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25 RAPAD, *Submission 145*, p. 14.

26 *Committee Hansard*, Victor Harbor, 5 April 2011, p. 12.

27 CeHA, *Supplementary Submission 201.2*, p. 3.

28 *Committee Hansard*, Adelaide, 4 April 2011, p. 27.



possibilities of broadband and reducing anxiety about the infrastructure rollout.

- 11.24 The Committee notes the recent announcement of the Federal Government's Digital Communities program, which will establish a 'Digital Hub' in each of the first 40 communities to be connected NBN fibre. These hubs will 'enable local residents to experience NBN empowered services and technology and also access education and training to learn skills required to participate in the NBN-empowered digital economy'.<sup>29</sup> The Committee welcomes this initiative and suggests that, if successful, consideration be given to extending the program to other communities as the rollout proceeds.
- 11.25 Several contributors to the inquiry told the Committee that leaders in local communities, known as 'digital champions', could be used to promote the uptake of broadband and other digital services. For example, Mr John McGee, Director of Digital Futures at the Tasmanian Department of Economic Development, Tourism and the Arts, told the Committee about plans to use the existing social networks of local champions to promote the NBN within the business community:
- ... the notion of social networking in the physical sense is really part of the strategy: identifying champions, making sure that they are as capable as they want to be and need to be and then allowing that normal social networking process to occur.<sup>30</sup>
- 11.26 Ms Pip Forrester, Chair of the McLaren Vale Grape, Wine and Tourism Association, said that it is important that information is delivered to people 'in as many ways as you can' and in a language they can understand.<sup>31</sup> She similarly talked about the value of using existing local networks:
- I think one of the key things is to deliver the information to where the people are. McLaren Vale is only an hour from Adelaide. To effectively get the information out, go to the core and use the people on the ground to make sure the right people are there. I guess, more formally, you need to do some really good networking.<sup>32</sup>
- 11.27 The National Farmers' Federation (NFF) suggested that given the low level of existing broadband use, regional areas may require specific
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29 DBCDE, *National Digital Economy Strategy*, p. 22.

30 *Committee Hansard*, Hobart, 11 March 2011, p. 69.

31 *Committee Hansard*, Victor Harbor, 5 April 2011, p. 42.

32 *Committee Hansard*, Victor Harbor, 5 April 2011, p. 47.

education programs to support uptake, including for businesses. NFF submitted:

Given the differences in people's experience and capabilities with information technology, and the variety of different uses to which broadband can be applied, a variety of communication packages will be required to properly inform people and support the roll out of the technology. Information packages, seminars, the use of mentors and local champions are all opportunities to improve awareness and support adoption of the new technology within communities.<sup>33</sup>

- 11.28 The Committee notes that the Government has recently nominated a number of national broadband champions in a range of fields.<sup>34</sup> While this is a positive development for improving consumer engagement, the Committee suggests that equipping champions at a more local level will have a more significant effect in raising awareness in rollout areas.
- 11.29 The Committee supports the view of inquiry participants that, complementing the *National Digital Economy Strategy*, a comprehensive engagement strategy is required to outline how the uptake of broadband and the utilisation of digital services can be encouraged. The engagement strategy should be developed in consultation with industry, consumer groups and other levels of government and should clearly outline the preferred roles of the different players in engaging with the public. It should encapsulate a range of engagement strategies including information campaigns, demonstration sites and support for local digital champions.

## Recommendation 6

**That the Federal Government develop a comprehensive engagement strategy incorporating a range of approaches to promote the uptake of broadband and digital technologies during the NBN rollout.**

33 NFF, *Submission 197*, pp. 4-5.

34 DBCDE, 'Broadband Champions' <<http://www.nbn.gov.au/media-centre/broadband-champions/>> viewed 27 July 2011.

## Assisting disadvantaged groups

- 11.30 As discussed in Chapter 8, inquiry participants described the ‘digital divide’ which currently exists in Australia, where certain social groups have lower levels of access to broadband services than others.
- 11.31 The Committee heard that overcoming this divide would go some way to improving the welfare of people who are currently isolated and disadvantaged. The Committee considers that increasing the participation of these groups is crucial to ensure the benefits of a ubiquitous, high speed network are delivered, including for the delivery of services (relating to health and education, for example) as discussed in Part One of this report.
- 11.32 The Committee considers that making shared public facilities available could be a practical and cost effective way of providing more universal broadband access. The most obvious way to achieve this will be to improve access via local public libraries and community centres, where resources already exist in many regions.
- 11.33 The Australia Council for the Arts told the Committee that well-equipped community centres will be ‘integral to all Australians benefiting from the NBN’, providing broadband services to range of members of the community who may otherwise not be able to access them:
- Older people, the disabled, socioeconomically disadvantaged people, newly-arrived migrants and Indigenous people living in remote communities are among those likely to access the NBN in community centres.<sup>35</sup>
- 11.34 The Committee notes that there are over 1500 public libraries across Australia, which are attended more frequently and by more people than any other cultural or sporting venue. More than half the population are registered as users.<sup>36</sup> As the Australian Library and Information Association (ALIA) explained:
- Located in every local government area across the nation and at the heart of their local communities, public libraries are perfectly positioned to deliver results in Australia’s digital future. Australia’s public libraries continue to address the need for equitable community access to a wide range of educational, information, cultural and recreational services which are dependent on online information services ...<sup>37</sup>

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35 Australia Council for the Arts, *Submission 232*, p. 13.

36 ALIA, *Submission 216*, p. 2.

37 ALIA, *Submission 216*, p. 2

- 11.35 In terms of the NBN, ALIA noted that libraries play ‘a significant role in the access and support for learning in our communities’, by providing access to technology, to PCs and ‘equipment that many in our society cannot afford’, and that even for people who may ‘have it all’, libraries provide a place of ‘convenience and community’.<sup>38</sup>
- 11.36 East Gippsland Shire Council noted that the download speeds and access able to be provided through libraries and council business centres would be superior to any fixed line or satellite services available in areas such as the East Gippsland region. The Council’s submission notes that ‘without this access these individuals and business will not be able to avail themselves of the higher level services promised by the NBN’.<sup>39</sup> Eurobodalla Shire Council notes that council libraries currently support 35 000 internet bookings each year, with an increasing trend. If broadband is not taken up in individual residences, the capability offered by the NBN provides a highly valuable service to be accessed by many in disadvantaged local communities.<sup>40</sup>
- 11.37 The Committee considers that where possible, libraries and other public facilities should not only include access to broadband, but access to private facilities for taking part in video conferences or calls. This will firstly provide access to broadband-enabled services to those who cannot afford to get services at home, and secondly, provide access to people living outside the fibre footprint who otherwise may not be able to access quality video-conferencing services. The Committee recognises libraries could play a central role in achieving this goal, and recognises the diverse possibilities in the development of these services. Ms Vanessa Little, representing ALIA, described the installation of ‘sound domes’ in a new, broadband-equipped library as providing privacy to users:
- We started out thinking: ‘We will do this for these grandmas, because they like to Skype. Under the sound dome, they can talk away but nobody around them can hear.’
- 11.38 Ms Little observed that beyond this initial service, these facilities may be used for the benefit of other groups in the community, for example, young people wanting to talk to a health professional about their mental health issues: ‘they can be sitting in my library at Gungahlin accessing that totally unknown. Nobody knows what they are doing.’<sup>41</sup> The Committee can see

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38 ALIA, *Submission 216*, p. 3

39 East Gippsland Shire Council, *Submission 14*, pp. [2–3].

40 Eurobodalla Shire Council, *Submission 52*, p. [1].

41 *Committee Hansard*, Canberra, 27 May 2011, p. 19.

how the provision for people to easily and privately access professional health services may serve to increase the likelihood of those services being used by people most in need, and who may not otherwise be able to benefit from the assistance such services provide.

- 11.39 The Committee heard from many inquiry participants about current programs which provide community internet access (for example, Broadband for Seniors kiosks and Neighbourhood Houses) that already provide free access points.<sup>42</sup> The Committee notes that there may be possibilities for more effective integration within, or between, existing services. ALIA told the Committee:

The Broadband for Seniors initiative, while not funded directly, has seen the program enter many public libraries in Australia, duplicating the work that public libraries were already delivered in those libraries.

Libraries are already conducting hundreds of training programs for our community on how to use the Internet – for free – as a community service.<sup>43</sup>

- 11.40 The importance of digital literacy skills for harnessing the NBN's benefits is discussed in more detail later in this chapter. However, the Committee believes that in any discussion of community access to and awareness of broadband services, the abilities of users should be borne in mind. The Committee acknowledges the observations of many inquiry participants that not all Australians will have the skills or abilities to immediately access all services which are envisaged to be deliverable via the NBN.

- 11.41 The potential for training to provide a means of community engagement and thereby help to address causes of social exclusion should not be underestimated. In this way, NBN access via libraries and community centres provides benefits not only in terms of actual services, but individuals who access appropriate training in a community environment may feel less intimidated, and be more likely to seek advice and assistance. This process of skills acquisition may also contribute to social inclusion and empowerment. Ms Little, of ALIA, noted that:

... the people who cannot afford to have the broadband to their home at the moment or who do not understand it and are quite nervous about it can come into my library and receive access and training on how to use it. If you are looking to build community

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42 Dr Deb Foskey, *Submission 23*, p. [2]; ALA, *Submission 163*; Government of South Australia, *Submission 195*, p. 3.

43 ALIA, *Submission 216*, p. 7.

engagement and use of this technology into the future, we are the place where people come now, so, with better access to the broadband services, we will be able to be ... promoting it and its various uses.<sup>44</sup>

- 11.42 ALIA has estimated that providing internet connectivity to every Australian public library would cost around \$8 million per annum.<sup>45</sup> The Committee agrees with the suggestion of ALA and others, that even if the NBN 'went to everyone's home at a reasonable price', the need to ensure access to broadband services by disadvantaged groups in the community would still exist.<sup>46</sup>
- 11.43 The Committee considers that for appropriate services to be provided and supported in an ongoing way through libraries and community centres, additional work needs to be done by the Federal Government to ensure that public access points connected to high speed NBN services are provided as swiftly, and efficiently, as possible.

## Recommendation 7

**That, recognising the important roles of public libraries and community centres, the Federal Government works in an appropriate capacity to implement a network of public access points connected to high speed NBN services in as many communities as possible.**

- 11.44 The Committee recognises that Broadband for Seniors is an example of a successful program for promoting digital inclusion, and welcomes the recent extension of program funding, as discussed in Chapter 8. The Committee considers that, if the 'digital divide' is to be successfully overcome, other targeted programs may be required to address access for other Australians who are disadvantaged, or who may be at risk of social isolation.

44 *Committee Hansard*, Canberra 27 May, p. 19.

45 Ms Sue Hutley, Executive Director, ALIA, *Committee Hansard*, Canberra 27 May, p. 22.

46 Ms Sally Thompson, Chief Executive Officer, ALA, *Committee Hansard*, Canberra, 4 March 2011, p. 52.

## Recommendation 8

**That the Federal Government, with other organisations as appropriate, develop targeted programs for those currently disadvantaged by the digital divide to improve awareness of publicly available high-speed internet facilities, to improve access, and to promote the development of relevant skills.**

### Outside the fibre footprint

- 11.45 As discussed in Chapter 9, evidence indicates that fibre connections to premises provide the best long term broadband solution due to their high capacity, symmetrical speeds, low latency and future scalability. Chapter 9 also noted that as it is economically impractical to deliver fibre connections to all premises in Australia, good quality fixed wireless and satellite services can provide a viable broadband alternative to premises in rural and remote areas where FTTP is not available.
- 11.46 As described at Appendix A, under the NBN project 93 per cent of Australian premises will be provided with fibre connections, including all communities with more than 1000 premises and all communities with more than 500 premises that are passed by fibre transit routes. Another 4 per cent of premises will be provided with LTE fixed wireless, and the remaining 3 per cent with next generation satellite services.

### NBN Network extensions

- 11.47 The Committee received a number of submissions from representatives of smaller communities that are expected to fall outside the NBN's fibre deployment areas.<sup>47</sup> For example, McKinlay Shire Council in North West Queensland told the Committee that although the town of Julia Creek (population 500) is on a fibre backhaul route and sits astride major rail and road links, it is not expecting to be provided with fibre connections under the NBN. The town has 'a GP, Hospital, State School and a full complement of Emergency Services' and McKinlay Shire Council submitted that towns like this would 'benefit enormously' from connection to the fibre network.<sup>48</sup>

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47 McKinlay Shire Council, *Submission 31*; Gloucester Shire Council, *Submission 6*; Wheatbelt East Regional Organisation of Councils, *Submission 40*; Get Connected, *Submission 43*; RDA Yorke and Mid-North, *Submission 121*, pp. 13–14; NFF, *Submission 197*; RDA Townsville and North West Queensland, *Submission 202*; NT Government, *Submission 209*.

48 McKinlay Shire Council, *Supplementary Submission 31.1*, p. [1].

11.48 While fibre is clearly the most preferred option, several submissions noted that where fibre is not possible, fixed wireless would be much more suitable than satellite for these types of small communities. As discussed in Chapter 9, while the NBN satellites will offer considerably better services than what is currently available, high latency caused by the vast distances involved in satellite communications is unavoidable and means that certain interactive broadband applications will still not be possible. For example, RAPAD told the Committee that while satellite broadband may be the only economically realistic option for individual remote homesteads, 4G fixed wireless broadband would be a much preferred option to service communities:

In terms of sustainability and value RAPAD has argued, in previous papers submitted to government, that 4G (LTE) or similar wireless technology should be deployed to communities targeted as satellite/wireless regions. 4G deployed as a fixed wireless platform (as opposed to a mobile platform) will give rural and remote communities far greater broadband performance (bandwidth and latency) than satellite.<sup>49</sup>

11.49 The Indigenous Remote Communications Association (IRCA) strongly recommended in its submission that either fibre optic or microwave (wireless) be used to deliver broadband to remote communities rather than satellite in order to 'reduce ongoing costs and latency, improve reliability and provide future capacity'.<sup>50</sup> It further submitted:

While planning for remote area delivery of the NBN is still unclear (beyond the satellite or wireless solutions), it appears that a satellite backhaul solution is being proposed for most remote communities. While we understand the economic logic, IRCA urges thorough consultation and long-term cost analysis prior to selection of technology.<sup>51</sup>

11.50 Although acknowledging that it is economically impractical in the short term, the Committee considers that FTTP connections to all communities should be the Government's long term goal, particularly given the limited life span of copper lines. The Committee welcomes the announcement that NBN Co is currently trialling a 'network extension program' in Tasmania to provide an option for communities outside the fibre footprint to pay the incremental funds needed for additional premises to be connected while

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49 RAPAD, *Submission 145*, p. 4.

50 IRCA, *Submission 82*, p. 7.

51 IRCA, *Submission 82*, p. 5.



NBN is rolling out fibre in their region. Mr Mike Quigley of NBN Co made the following comments on the program at the Committee's public hearing in Sydney:

An individual or a group of people might say, 'We are not inside the fibre footprint, but we would like to get the fibre anyway. What is the process for doing that?' We have had approaches from some councils who have said, 'We are prepared to fund the difference between what that 93rd percentile would be, if we were in the 96th, for example.' But I should also say if you see a graph of costs per connection per percentile, from the first percentile through it is relatively flat and then there is a knee. It goes up very rapidly after the 93rd percentile, which means that from 95 to 97 it is very expensive per subscriber to provide a fibre connection.<sup>52</sup>

- 11.51 At the time of writing, NBN Co had not publicly released more detailed information about how the network extension program will work; however, the NBN Implementation Study discusses the possibilities in some detail. It notes that premises connected to fibre should be considered as additional to NBN Co's 93 per cent fibre coverage goal, and care should be taken to ensure that the program does not 'disrupt the broader rollout plans' for the network. It suggests that financial contributions towards the network extension could be received from 'businesses, not-for-profit organisations, state and local governments' or from the Federal Government, 'independently of its equity investment in NBN Co'.<sup>53</sup>

### Backhaul extensions to remote communities

- 11.52 Another issue raised by inquiry participants representing rural and remote areas was that while they recognise the potential benefits of broadband, many areas still do not have adequate mobile telephone services. For example, Ms Mel King from the Tasmanian Farmers and Graziers Association, told the Committee:

The chair of our council cannot find a mobile phone that will work on his property. We wait for him to come in during the night or ring his wife to try to get hold of him. It is not a good way to operate. This is the sort of system that these guys operate under every day. Farmers are becoming more mobile. They are up at dawn and out till dusk and are driving constantly and are not

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52 *Committee Hansard*, Sydney, 29 April 2011, p. 4.

53 McKinsey-KPMG, *National Broadband Network Implementation Study*, 2010, pp. 75-77.

there to answer the phone, yet they need access to those sorts of things for marketing.<sup>54</sup>

- 11.53 IRCA submitted that 'mobile telephony should be seen as a primary telephony service for remote Australia', and that 'selection of backhaul technology should support telephony as well as broadband access'.<sup>55</sup> It suggested that access to adequate mobile services is 'a higher priority than broadband' in many communities, adding:

Despite numerous reviews and programs, this continues to be a major issue. With shared housing, low income and mobile populations, the ideal telephony solution for remote communities is mobile telephony, with call rates capped and pre-paid services included under a revised Universal Service Obligation (USO).<sup>56</sup>

- 11.54 The Committee heard that the NBN fibre network may, with time, contribute to better mobile services in remote areas by lowering the cost of connecting mobile base stations. Mr Maha Krishnapillai, Director of Government and Corporate Affairs at Optus, told the Committee that with fibre links being deployed to many more parts of the country under the NBN, backhaul fibre for mobile base stations will be accessible in more areas. He explained:

There are a number of issues in terms of higher speed mobile broadband that we need to work through, one of which is availability of spectrum. The other one is simple location of base stations. The third one is clearly the fibre capacity we have to link those base stations. We see that as a big opportunity for regional Australia because at least one of those three will be not necessarily eliminated, but minimised, in terms of our capacity to offer high-speed broadband via mobile in regional Australia.<sup>57</sup>

- 11.55 As outlined at Appendix A, the Federal Government's Regional Backbone Blackspots Program (RBBP) is being used to fill gaps in Australia's fibre backhaul networks in regional areas. This is enabling DSL broadband services to be provided to towns and cities along the RBBP links that were not able to be provided before. For example, Mr David Buckingham of iiNet told the Committee that the backhaul link to Geraldton is enabling it to offer competitive ADSL2+ services to 2000 households in that

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54 *Committee Hansard*, Launceston, 10 March 2011, p. 42.

55 IRCA, *Submission 82*, p. 7.

56 IRCA, *Submission 82*, p. 5.

57 *Committee Hansard*, Sydney, 29 April 2011, p. 24.

community for the first time.<sup>58</sup> NEC Australia recently announced that it is rolling out 62 new DSLAMs in centres along the five RBBP links.<sup>59</sup>

- 11.56 However, Mr Mark Needham, member of the outgoing Regional Telecommunications Independent Review Committee (RTIRC), told the Committee there is still much of Australia beyond the RBBP program and outside the NBN fibre footprint that would benefit from additional backhaul links. Mr Needham suggested that unallocated interest from the previous Government's Regional Telecommunications Fund could be used to pay for fibre backhaul links to more communities where FTTP is not economically practical.<sup>60</sup> This would enable significant improvements to services in those communities:

There is a difference between providing fibre to the town and fibre to the premises. I think many people would like to have fibre to their community, at least as a start, rather than even considering fibre to the premises – because ... reticulation of services at the end of fibre can still achieve a very acceptable outcome ...<sup>61</sup>

## Applications and content

- 11.57 Many inquiry participants pointed out to the Committee that while the NBN will provide important enabling infrastructure, the realisation of its potential benefits will depend on the online services and applications that are developed to utilise it. For example, Contract IT submitted:

Let's be perfectly clear, the NBN is a facilitating technology, how we engage and interact with that technology will determine if Australia experiences social benefits or not. The technology itself is neutral. We can do more good and we can do more bad.<sup>62</sup>

- 11.58 Similarly, Mr Stanton of Communications Alliance told the Committee:

58 *Committee Hansard*, Perth, 5 May 2011, p. 1.

59 NEC Australia, 'NEC upgrades regional networks to better connect nationwide broadband delivery', *Media Release*, 28 July 2011 <<http://www.nec.com.au/media/docs/110728-NEC-Nextep-Network-Upgrade-press-release-FINAL-2-7c97f0f9-aad1-4aae-8799-eff9262ad948-0.pdf>> viewed 29 July 2011.

60 *Committee Hansard*, Brisbane, 18 April 2011, p. 18. For information about the Regional Telecommunications Fund, refer to Peter Costello, Treasurer, 'Budget Treatment: Regional Communications Fund', *Media Release No.081*, 13 September 2005 <<http://www.treasurer.gov.au/DisplayDocs.aspx?pageID=&doc=pressreleases/2005/081.htm&min=phc>> viewed 29 July 2011.

61 *Committee Hansard*, Brisbane, 18 April 2011, p. 18.

62 Contract IT, *Submission 225*, p. [2].

... the network in itself will not achieve everything that we are looking for in terms of digital economy development, because unless there is a reason to connect and to use it at high speed people will not. They will need applications and they will need the opportunity to take advantage of what the network can provide, but at the end of the day it is a layer 2 network. The magic is above layer 2. They are the sorts of things that will drive economic benefit and substantial take-up.<sup>63</sup>

- 11.59 Throughout the inquiry, the Committee heard that there are a wide range of existing broadband applications and services that have low bandwidth requirements and are commonly available now, but are restricted in their utilisation due to a lack of ubiquitous broadband connectivity. For example, Chapter 2 noted that many government agencies are constrained in their ability to offer services online as they need to be able to provide equal services to people with poor connections (the 'lowest common denominator' approach); Chapter 3 noted that successful e-health implementation requires uniform capability across the health system; and Chapter 5 noted that smart grids need a ubiquitous and reliable network to be effective.
- 11.60 The Committee also heard that there are a wide range of applications and services that are currently limited in their adoption due to high bandwidth requirements. Examples include augmented reality and 3D simulations for learning, as noted in Chapter 4; high quality two-way video-conferencing, as noted in Chapter 6, and ultra high definition television, as noted in Chapter 9.
- 11.61 Beyond these existing applications, the Committee heard that the NBN will enable new applications and services to be developed, many of which are not even envisaged as yet. These applications will only be enabled as broadband improves in both its bandwidth capacity and its ubiquity, as discussed in Chapter 9. Mr Bret Treasure, member of the Australian Web Industry Association (AWIA), told the Committee that:

... there are clearly applications which have not been developed yet and there are developments of applications which already exist but do not have enough bandwidth to be successful. It is clearly difficult for us to blue sky about the applications that have not yet been developed, but I do not think that we should ignore that that is going to happen.<sup>64</sup>

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63 *Committee Hansard*, Sydney, 29 April 2011, p. 34.

64 *Committee Hansard*, Perth, 5 May 2011, p. 38.

- 11.62 The Committee notes the vast changes to the way people work and interact that have been enabled by improved connectivity over the last 20 years. Since the early 1990s, ICT applications that have become commonplace in the average household include desktop and notebook personal computers, cordless phones, mobile phones, digital cameras, satellite navigation, the World Wide Web, email, search engines, social networking sites, online maps, YouTube, Skype, and iTunes. The Committee considers that there is good reason to expect that the NBN will enable at least as many new applications to be developed over the next 20 years.
- 11.63 Some inquiry participants attempted to predict what some of the future applications enabled by improved broadband might be. For example:
- Dr Dean Economou, Technology Strategist at NICTA, told the Committee that holographic technology, which is in the early stages of development now, may become mainstream in 20 to 30 years.<sup>65</sup>
  - Mr Darren Merritt, a qualified computer scientist, told the Committee that by enabling more accurate GPS systems, the NBN could help facilitate an 'entirely new field of technology' with applications that could include driverless cars, planes, street sweepers, road repairs and lawn-mowers.<sup>66</sup>
  - Mr Treasure of the AWIA told the Committee about an emerging technology in which animated avatars from the 'virtual world' are overlaid into the real world through projections onto the inside of a pair of glasses. The technology could have significant applications in marketing and other areas.<sup>67</sup>
- 11.64 The Committee recognises that the NBN will provide Australia with an opportunity lift its R&D performance and to lead the world in the development of new applications using high speed broadband. As discussed in Chapter 7, the NBN will enable new forms of R&D to take place, improve the capacity for research collaboration and attract foreign investment in Australia's ICT R&D sector. However, continued government support is required to ensure these opportunities are maximised. In particular, continued investment in research, innovation and commercialisation of broadband applications is required. Effort is also

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65 Dr Dean Economou, Technology Strategist, NICTA, *Committee Hansard*, Sydney, 29 April 2011, p. 58.

66 Mr Darren Merritt, *Submission 18*, p. [1].

67 *Committee Hansard*, Perth, 5 May 2011, p. 38.

required to ensure appropriate regulatory frameworks are in place to promote R&D in the private sector.

### **Recommendation 9**

**That the Government provide continued support for organisations involved in the development of high speed broadband applications.**

### **Recommendation 10**

**That the Government maintains regulatory support to encourage increased levels of research and innovation in the private sector and recognises the NBN's importance to the realisation of its innovation agenda.**

- 11.65 Chapter 8 of this report discussed evidence from a number of organisations about the need for government support to digitise the content of libraries and museums.<sup>68</sup> The Committee recognises the substantial benefits that would result from the digitisation of cultural and historical collections for access online by the public, and supports a role for government in enabling this.

### **Recommendation 11**

**That the Government develop a strategy for the digitisation of Australia's culturally and historically significant content.**

- 11.66 Chapter 8 also discussed evidence that the availability of quality Australian online content could be put at risk if measures are not taken to address copyright theft online.<sup>69</sup> The Committee recognises that there is a

68 National and State Libraries Australasia (NSLA), *Submission 53*; National Library of Australia (NLA), *Submission 106*; Museums Australia, *Submission 162*; Council of Australasian Museum Directors, *Submission 168*; Australian Library and Information Association (ALIA), *Submission 216*.

69 Copyright Agency Limited, *Submission 92*; The Australian Content Industry Group, *Submission 108*; Australian Recording Industry Association, *Submission 112*; Australian Publishers Association, *Submission 136*.

need for a robust framework for the protection of intellectual property to encourage innovation and investment in quality local content.

## Recommendation 12

**That the Government facilitate discussions between representatives of key content industries and internet service providers to work towards an agreed framework for minimising online copyright theft.**

## Skills development

11.67 The Committee received evidence that in order to achieve the widespread uptake and utilisation of services enabled by the NBN, ongoing investments will need to be made in skills development. This section will consider two aspects of skills development: digital literacy for the general community, and professional ICT skills.

### Digital Literacy

11.68 The Committee was informed about the need for increased digital literacy training to help manage social and generational differences in the general public's level of confidence with digital technologies. For example, the Australia Council for the Arts noted in its submission that access is not just about having the technology but also the knowledge of how to use it and of what to do when things do not go smoothly. The Committee agrees with the Council's view that 'as the potential of the NBN for delivery of educational and health services becomes a reality, it is important to ensure that existing inequities are not exacerbated'.<sup>70</sup>

11.69 Ms Rosemary Sinclair of the Australian Telecommunications Users Group (ATUG) told the Committee that the development of digital literacy skills for workplaces is a 'really important piece of work':

It is really marvellous that all our teenagers understand how to use Twitter and Facebook and the like. It is very important that our workplaces and all our employees become skilled at the use of these communications tools as well.<sup>71</sup>

<sup>70</sup> Australia Council for the Arts, *Submission 232*, p. 13.

<sup>71</sup> *Committee Hansard*, Sydney, 29 April 2011, p. 36.

## Building capability amongst consumers

- 11.70 Several participants referred to these generational differences in terms of 'digital natives' and 'digital immigrants'.<sup>72</sup> A 2009 Government report defined digital natives as 'those who do not know life without a computer, the internet and MP3s' and notes that digital natives 'first log-on earlier in their lives than previous generations and rarely log-off'. This contrasts with digital immigrants, who 'learn and adopt the internet and related technologies later in life'.<sup>73</sup>
- 11.71 Illustrating these differing needs, the recently released outcomes of a 2009 OECD survey found that Australian students (digital natives) ranked equal second in the world in their digital literacy skills.<sup>74</sup> In comparison, as discussed in Chapter 8 on the community and social impacts of the NBN, older people, as well as many people from disadvantaged backgrounds, are having to learn how to use digital technologies later in life (digital immigrants) and may not have the basic skills needed to take advantage of the NBN's potential. ABS statistics show that nearly 70 per cent of Australians aged over 65 did not access the internet at all in 2008-09.<sup>75</sup>
- 11.72 In its submission, ALA provided the Committee with a copy of an email from one of its member organisations in regional NSW which highlighted the 'importance of investing in training for older users of the NBN':
- We have become aware of the fact that many of our members have been 'given' or had an old computer 'passed over' to them from children or grandchildren. But without any assistance/training or help ... and lack of checking whether the training terminology was being understood.
- Our members have email addresses, usually kindly organised by the 'donors'. So they inform us of this. We sent messages and our newsletter to them. They are not informed as we find out that they have no idea how to respond to our emails or download and/or print out our newsletter.<sup>76</sup>
- 11.73 The letter argued that the a 'concerted effort' is required in order to provide information explaining 'what the NBN is all about' to people

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72 RAPAD, *Submission 145*, p. 13; The Alannah and Madeline Foundation, *Submission 206*, pp. 4-5; JCU, *Submission 85*, p. [2]; Council of Australasian Museum Directors, *Submission 168*, p. 8.

73 DBCDE, *Australia's Digital Economy: Future Directions*, 2009, p. 40.

74 OECD, *PISA 2009 Results: Students On Line: Digital Technologies and Performance (Volume VI)*, p. 78.

75 ABS, *Household Use of Information Technology Australia 2008-09*, 16 December 2009, p. 35.

76 ALA, *Submission 163*, pp. [3-4].



without technical knowledge, and training them in 'how they can use the technology for their own benefit'. ALA suggested that these issues would be similar for other disadvantaged groups on the 'wrong side of the digital divide'.<sup>77</sup>

- 11.74 Ms Sinclair of ATUG told the Committee that ongoing support will need to be available for people at the time that the network and its associated technologies are rolled out, because 'that is when people learn; when they have the question they go looking for the answer'.<sup>78</sup> She said that the Internet Assistance Program had been helpful for providing support in the past, and suggested that a similar program should be developed to provide support for older users:

[The Internet Assistance Program] provided a service where people could ring and get information about how to ensure that their service was running at the maximum. I think that sort of infrastructure needs to be put in place. I know in my own community older people are interested in using the internet and broadband but unless there is some family member available they get stuck.<sup>79</sup>

- 11.75 Dr Tim Williams, independent consultant for Huawei, told the Committee that in the UK, community based organisations have played a key role in engaging socially excluded groups by teaching them about broadband technology:

One thing that is interesting in Britain is the role of third sector voluntary organisations, social enterprise organisations and housing associations, where they meet people on a regular basis and they have very good cultural links to help them explore in a rather incremental way what they can do with this technology. It is particularly important with older people.<sup>80</sup>

- 11.76 Ms Sinclair agreed that not-for-profit organisations could have a key role in digital skills development 'because they are engaging with more disadvantaged members of the community'. She also suggested that community libraries could play a central role, noting that people are 'not frightened to come to the library' and librarians are 'very valued members of the community'.<sup>81</sup>

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77 ALA, *Submission 163*, pp. [3–4].

78 *Committee Hansard*, Sydney, 29 April 2011, p. 37.

79 *Committee Hansard*, Sydney, 29 April 2011, p. 37.

80 *Committee Hansard*, Sydney, 29 April 2011, p. 15.

81 *Committee Hansard*, Sydney, 29 April 2011, p. 37.

- 11.77 As noted earlier in this chapter, in addition to providing free public access, there is an opportunity for digital literacy training programs to be delivered in libraries. Ms Sue Hutley from ALIA told the Committee that the community expectations for internet assistance are growing 'at an exponential rate' as more activity takes place online, and libraries are already playing a role in providing this assistance:

There is a demand for assistance from public library staff in using electronic services, not only for government information but also for everyday living skills, including e-banking, setting up mobile phone accounts, online shopping and setting up email accounts. A large part of this demand comes from people at low socioeconomic levels, the unemployed and the elderly. Government agencies are still sending people to their local public library for government information and to access social assistance forms and income tax forms, renew their licence and fill out driver testing forms.<sup>82</sup>

- 11.78 The submission from ALIA called for an appropriate program to be developed to support user education and training in basic internet skills for 'all Australians'. It warned that without this training, 'many Australians will continue to be disadvantaged and will miss out on benefiting from access to digital services'. It also argued that to ensure the adequacy and sustainability of outcomes, funding would be required 'on an ongoing basis' and 'should be conducted by organisations such as libraries which are part of the long term community infrastructure'.<sup>83</sup> The submission notes:

It is the unemployed, pensioners, the homeless, single-parents, people with a terminal illness and families already struggling financially who use public libraries. These are the people that should and could benefit from access to the Internet but more importantly they need ongoing training and skills development to ensure that they are not left behind as a digital citizen.<sup>84</sup>

- 11.79 The Committee accepts the view that programs will need to be developed to equip 'digital immigrants' with the skills and knowledge they need to take advantage of broadband and other digital technologies. The Committee notes that the recently extended Broadband for Seniors program targets skills development amongst older Australians, and that the Digital Communities initiative will provide sites in the first 40 NBN
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82 *Committee Hansard*, Canberra, 27 May 2011, p. 17.

83 ALIA, *Submission 216*, pp. 8-9.

84 ALIA, *Submission 216*, p. 3.

fibre rollout areas in which these types of programs will be delivered.<sup>85</sup> However, the Committee considers that there will be further scope for digital literacy training programs targeting broader demographics as the NBN rollout continues. The Committee accepts that libraries are well placed to deliver these types of programs.

### **Recommendation 13**

**That the Government provide further support for digital literacy programs, based on the Broadband for Seniors kiosk model, making use of existing resources such as libraries and not-for-profit groups where possible.**

### **Building capability in small and medium enterprises**

11.80 In addition to digital literacy training for the general public, the Committee was advised that support is required to assist small and medium enterprises (SMEs) with the transition to a digital economy. For examples, the Department of Innovation, Industry, Science and Research (DIISR) told the Committee:

Many SME owners and managers are focussed on the day to day running of their businesses. This creates considerable room for improvement in the way they use existing information technologies. As a result, they will not automatically understand or know how to use the potential benefits of new technologies such as the NBN.<sup>86</sup>

11.81 The Committee heard about a number of local and national level programs for assisting and supporting businesses with using broadband-enabled technologies.

11.82 The Southern Adelaide Economic Development Board, which was established by the municipalities of Marion and Onkaparinga, told the Committee about the 'Fostering Online Entrepreneurship Program' which it ran in 2008. Under the program, which had a relatively small budget, 30 businesses (selected from a pool of over 100 who had expressed interest) were led through 'a structured process over three months to establish their

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85 DBCDE, *National Digital Economy Strategy*, May 2011, p. 22.

86 DIISR, *Submission 219*, p. 27.

own online presence and marketing strategies'. Of these businesses, 15 had made online sales by the end of the program and eight others were expecting to make sales within a few months.<sup>87</sup> Mr Brian Hales, Economic Development Advisor at the City of Onkaparinga, told the Committee that due to the success of the program and the 'huge' level of demand from businesses, the organisation has put forward a funding proposal for a greatly expanded program to be delivered in the future. He noted that amongst businesses 'there is a desire [to improve digital literacy] but a lack of capacity to know how to execute that desire'.<sup>88</sup>

- 11.83 Mr Steven Harrison, Director of Business and Economic Development at the City of Prospect in Adelaide, told the Committee that around 140 local small businesses had participated in its two and a half day online entrepreneurship program. Mr Harrison said that while the organisers initially had some difficulties getting businesses to participate due to a lack of understanding about the aims of the program, feedback afterwards was overwhelmingly positive: '... all 140 who did the training program have boasted to us that it was the best thing they have ever done and it has changed their thinking. It has grown their businesses – in some instances, quite considerably.' A particularly successful example mentioned by Mr Harrison is that of a local hairdresser who completed the program:

He is telling us that he is getting between 10 and 15 new clients every week, just off the internet. So he has tapped into that market of people like you who come to Adelaide and, if you are talking at a conference or an event, want to get your hair done ... Five or 10 new clients a week at \$250 a pop is a lot of economic benefit, and he comes and spends that money locally in our shops and cafes and in using local services.<sup>89</sup>

- 11.84 At its public hearing in Ballarat, Victoria, the Committee was told about a program in which the University of Ballarat has partnered with Lateral Plains Pty Ltd, a local ICT company, to assist businesses and local governments in the region to integrate technology into their work practices. Mr George Fong, Executive Director of Lateral Plains, told the Committee that examples of the technological solutions his company helps clients with include email filtering, online buying services and cloud services for clients with multiple offices across regional areas. When communicating with clients, Mr Fong said his business tries to 'take away the issues of technology process' and focus on outcomes instead:

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87 Southern Adelaide Economic Development Board, *Submission 104*, p. 8.

88 *Committee Hansard*, Victor Harbor, 5 April 2011, pp. 28, 34.

89 *Committee Hansard*, Adelaide, 4 April 2011, p. 70.

Many of them come to us somewhat intimidated by technology. It does not matter where you are, whether you are in a city or metropolitan area, small businesses tend to be intimidated by technology. Our job is to refine some of the outcomes for those businesses and, if there is a technical logical solution which we think is efficient, we try to fit that solution to the businesses which come to us.<sup>90</sup>

- 11.85 The Committee notes that in addition to these locally initiated programs, there are existing Federal Government programs that aim to educate and assist SMEs with utilising digital technologies. DIISR told the Committee about its Enterprise Connect program, under which it holds workshops to educate SMEs about possibilities for improving their business practices, then connects participants with business advisors who assist them with how those possibilities can be applied to their individual circumstances.<sup>91</sup>
- 11.86 DIISR also told the Committee about its Small Business Online Program, which was 'designed to assist small businesses to go online prior to the NBN rollout' and has assisted around 25 000 small businesses to date, including many home-based businesses.<sup>92</sup>
- 11.87 The Committee heard that the Department of Broadband, Communications and the Digital Economy (DBCDE) has launched a program called 'Digital Enterprise' which is specifically targeted on the initial NBN rollout sites.<sup>93</sup> Digital Enterprise aims to 'provide advice to businesses on how to use the NBN to diversify their operations'. It will also assist not-for-profit organisations to use the NBN to 'extend their reach into the community, expand their donor pool and achieve administrative efficiencies'.<sup>94</sup> Additionally, DBCDE's recently launched digitalbusiness.gov.au website provides 'information and advice to assist small and medium businesses and not-for-profit organisations to establish or enhance their online presence and to get the most out of online communications and productivity tools'.<sup>95</sup>
- 11.88 The Committee agrees with the view that there is a role for government in educating SMEs and supporting them in how to make full use of the opportunities provided by the NBN's rollout. It supports the continuation

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90 *Committee Hansard*, Ballarat, 17 March 2011, pp. 37-38.

91 *Committee Hansard*, Canberra, 6 July 2011, p. 8.

92 *Committee Hansard*, Canberra, 6 July 2011, p. 8.

93 *Committee Hansard*, Canberra, 6 July 2011, p. 8.

94 DBCDE, *National Digital Economy Strategy*, May 2011, p. 28.

95 DBCDE, *Submission 215*, p. 68.

and ongoing expansion of programs that have been initiated both at local and national levels to provide this assistance.

#### **Recommendation 14**

**That the Government continue to support programs that equip small and medium enterprises with the knowledge and support they need to compete in the digital economy.**

### **Professional ICT skills development**

11.89 Beyond the need for training business users and the general public in readiness for the NBN, the Committee heard that the ICT sector is facing a skills shortage that, if not addressed, could reduce the capacity for the NBN's potential to be realised.

#### **The ICT skills shortage**

11.90 Mr Adam Redman, Manager of Government Relations at the Australian Computer Society (ACS), told the Committee that there is a current shortfall of around 2000 places per quarter in terms of ICT skills to positions, and noted variations across Australia in the particular skills that there are shortages of in particular locations. He warned that 'we are very quickly approaching a situation where we just will not have enough people to operate the NBN and maximise its potential'.<sup>96</sup>

11.91 The ACS noted in its submission that the NBN's performance is 'highly dependent on a skilled workforce with appropriate capability and capacity', and suggested the viability of the NBN could be severely impacted 'unless current policy settings and paradigms regarding education and skilled immigration change'. The ACS identified barriers to skills development in the ICT sector as including 'a lack of clear articulation for ICT careers' as well as ageism and gender imbalances in the workforce.<sup>97</sup>

11.92 The Committee heard that there are differing levels of skill requirements across the ICT sector depending on the work involved. Mr Gary Ballantyne, Huawei's NBN Account Director, told the Committee that as

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<sup>96</sup> *Committee Hansard*, Brisbane, 18 April 2011, p. 75.

<sup>97</sup> ACS, *Submission 146*, p. 3.

an equipment vendor, Huawei needs highly-skilled university graduates, but noted that the training requirements for cable installers and other parts of the industry are more suited to the TAFE level.<sup>98</sup> Mr Jeremy Mitchell, Huawei's Director of Corporate and Public Affairs, pointed out that Huawei has partnered with RMIT to provide 2000 training places to generate more local skills in working with next generation technologies.<sup>99</sup>

- 11.93 Ms Valerie Maxville, a Perth-based industry professional, told the Committee that the skills shortage is partially explained by the low levels of new ICT student enrolments in recent years:

It has been a tough time for computing in terms of student enrolments in general. Since 2000 it has plateaued, but it is the bottom of the plateau. There has been a five per cent reduction in student enrolments each year since 2000.<sup>100</sup>

- 11.94 The Communications, Plumbing and Electrical Union (CEPU) suggested the skills shortage has been exacerbated by the winding back of Telstra's internal training programs, which have been previously relied upon by other companies in the industry as a source of trained staff. It advised that the shortage has been compounded by the retirement of older Telstra staff and a 'reluctance' in the industry to train employees for fear of them being 'poached' by competitors. Additionally, CEPU noted that the increased use of outsourcing by telecommunications companies in recent times has increased the number of sub-contractors, for whom investing in training 'may not be a realistic option'.<sup>101</sup>

### Structural change in the postal sector

- 11.95 The Committee is aware that as much as the development of the digital economy is opening up commercial and employment opportunities, other industries will confront transitional and transformational issues themselves as a result of wider access to broadband. Notably, the Committee took evidence that flagged the impact of such change on Australia's postal sector.
- 11.96 The CEPU told the Committee that the spread of the internet, off a platform of access to superfast broadband, is impacting on postal operations world-wide, including in Australia. Businesses, especially those who have traditionally been large users of postal services, are

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98 *Committee Hansard*, Sydney, 29 April 2011, p. 18.

99 *Committee Hansard*, Sydney, 29 April 2011, p. 18.

100 *Committee Hansard*, Perth, 5 May 2011, p. 33.

101 CEPU, *Submission 187*, p. [2].

actively substituting physical forms of communication for electronic ones. The submission from CEPU explained:

Substitution from physical to electronic forms of communication and the resulting decline in mail volumes is presenting a major challenge to the business model of traditional postal operators. These changes are occurring at a time when many of the historic protections offered to the postal service in order to ensure its viability are being progressively dismantled.<sup>102</sup>

- 11.97 The Committee heard that Australia Post has embarked on a process of organisational restructuring, which will also see it commit \$20 million over three years to prepare its 40 000 employees for repositioning and new areas of business. However, the CEPU argued that the demands of retraining a workforce faced with this level of industry transformation will require further structural assistance and engagement by Government.<sup>103</sup> The Committee notes that there has been a significant decrease in regular mail volumes as a result of internet services, but that this had been offset to some extent by a significant increase in parcel post stimulated by the increase in online purchasing.<sup>104</sup>
- 11.98 The CEPU advised that it has urged the Government to actively examine what measures can be developed to help Australia's postal service reposition itself in the face of this technological change, similar to the way other industries in the manufacturing, forestry and telecommunication sectors have been helped to manage large scale industrial restructure.<sup>105</sup>

### Improving data and analysis

- 11.99 CEPU submitted that a lack of accurate and reliable data has been a 'fundamental obstacle' to the development of evidence-based policy concerning the ICT sector. It told the Committee that unreliable data has 'been a source of frustration to the union and other industry members involved in labour market policy issues for many years', and noted that 'data from the Australian Bureau of Statistics (ABS) is based on industry and occupational definitions which do not always match the actual jobs performed in the workplace or the current terminology used to describe them'.<sup>106</sup>

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102 CEPU, *Submission 187*, p. [9].

103 CEPU, *Submission 187*, p. [11].

104 Mr Jim Metcher, Secretary, NSW Postal and Telecommunications Branch, Communications Division, CEPU, *Committee Hansard*, Melbourne, 18 March 2011, p. 49.

105 CEPU, *Submission 187*, p. [14].

106 CEPU, *Submission 187*, p. [5].



- 11.100 CEPU acknowledged that this is partially a reflection of the ‘dynamic nature of the ICT sector’ and the ‘growing pervasiveness of ICT’, but suggested it also indicates a lack of appropriate resourcing for the ABS. The submission noted that the ABS intends to conduct its ICT industry surveys only once every six years, making the data ‘virtually useless for policy purposes’.
- 11.101 The ACS also told the Committee that the way the ICT sector is measured could be improved. It proposed a review of the ANZSCO/ANZSIC framework to ‘more accurately measure the ICT sector, its growth and impact’, and a move to measure the digital economy using an ‘input/output’ framework.<sup>107</sup> Mr Redman explained that ANZSCO and ANZSIC coding ‘ultimately forms the basis of all government statistical data’, and expressed confidence that ‘if we can get that reviewed, we will be on the right track’.<sup>108</sup>
- 11.102 The Committee accepts that, given the rapidly changing nature of the sector, there is room for improvement in the timing and methodology used to measure the status and outcomes of the ICT industry. It suggests the Government continue to work with stakeholders to find more appropriate solutions for the industry, within the available resources.

### Addressing the skills shortage

- 11.103 CEPU observed that the NBN project has created both opportunities and needs for ‘a more systematic approach to skill formation in the telecommunications sector than has existed in the industry in recent years.’<sup>109</sup> Mr Burt Blackburne, Assistance Secretary of CEPU’s Communications Division, explained the need for a national strategy for the development of a ‘digital workforce’, including:

... not only those directly involved in the construction and operation of the NBN but also those who will develop and manage the applications and services which it, and any other broadband platforms, will carry.<sup>110</sup>

- 11.104 CEPU advised the Committee that coordination between state and federal governments, industry representatives and the education sector is

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107 ACS, *Submission 146*, p. 2.

108 *Committee Hansard*, Brisbane, 18 April 2011, p. 78.

109 CEPU, *Submission 187*, p. [2].

110 Mr Burt Blackburne, Divisional Assistant Secretary, Communications Division, CEPU, *Committee Hansard*, Melbourne, 18 March 2011, pp. 44–45.

required in order to address the issue of ICT skills across the economy.<sup>111</sup> It recommended a national digital workforce plan be developed, encompassing measures to improve data collection on ICT skills and employment, prioritise the development of ICT skills, institute a whole-of-government approach to 'e-skills' development, and co-ordinate existing programs to maximise NBN-related training opportunities.<sup>112</sup>

- 11.105 The ACS similarly called for national leadership in addressing this issue, and suggested that more attention should be paid to improving ICT career pathways. It suggested the Government take a lead role in facilitating the adoption of nationally consistent Work Integrated Learning (WIL) programs in the education sector.<sup>113</sup> Mr Redman compared the ICT sector to other professions:

In most medical professions, you have got to do a period of supervised work. It is the same in law and various other professions. In ICT, you do not get that. You go to university, and the universities are not really into vocational training; they are into knowledge transfer and fulfilling their charter, producing graduates who are not work ready – they do not know about business culture; they do not know how to hit the ground running.<sup>114</sup>

- 11.106 The Committee recognises that the current shortage of professional ICT skills is a serious concern that will potentially become worse as Australia's digital economy develops if action is not taken to address the issue. The Committee agrees with inquiry participants that the Government has a leadership role to play in addressing skills shortages. It suggests a strategy be developed in consultation with state governments, industry representatives and education providers to find ways of increasing the level of skills development and retention across the ICT sector.

## Recommendation 15

**That the Government develop strategies for the collection and provision of data on workforce needs in the ICT sector into the future.**

111 CEPU, *Submission 187*, pp. 4–5.

112 CEPU, *Submission 187*, pp. 5–8.

113 ACS, *Submission 146*, p. 3.

114 *Committee Hansard*, Brisbane, 18 April 2011, p. 76.

**Recommendation 16**

**That the Government develop a long term strategy to up-skill and/or retrain the existing workforce and develop new training programs to address emerging skills gaps.**

Sharon Bird MP  
Chair  
August 2011





## Dissenting report—Mr Paul Neville MP, Mr Paul Fletcher MP, Mrs Jane Prentice MP

### 1. Summary

- 1.1 This Dissenting Report sets out the views of the Coalition Members of the Committee, Paul Fletcher MP, Paul Neville MP and Jane Prentice MP.
- 1.2 We believe this inquiry into the NBN was the wrong kind of inquiry at the wrong time. It was a highly political exercise, designed to generate a feel-good report offering support for the rollout of the NBN. To be meaningful, this inquiry should have been conducted before the decision to spend \$43 billion on the NBN, and it should have been structured as a cost-benefit analysis, rather than a shopping list of benefits without any consideration of cost.
- 1.3 The Coalition supports an upgrade of Australia's broadband infrastructure. We think Labor's NBN is the wrong way to do it. It spends far too much money (with total announced expenditure already exceeding \$50 billion); it establishes a new government owned monopoly; and it will lead to higher prices and poorer service than in a competitive market.
- 1.4 Our views have been very much reinforced by this inquiry. We have seen some impressive examples of the ways in which broadband can deliver benefits in health, education, government, business and other sectors. But that has never been in dispute; what is in dispute is the right way to secure these benefits, what kind of networks are required, and who should own and operate them.
- 1.5 Our first conclusion is that the NBN has been poorly planned and implemented. The evidence we received suggests that:

- There was little planning prior to the 2009 announcement that the Rudd Government was abandoning its fibre to the node network and building a fibre to the premises network
- Key network and rollout decisions are driven by political considerations
- There is poor communication with industry
- The degree of preparation by Commonwealth Departments is unimpressive.

1.6 Our second conclusion is that many of the key claims which have been made about the NBN by the Rudd-Gillard government are overblown and cannot be substantiated. For example, the benefits of telemedicine will not be secured without a great deal of additional work - upgrading broadband access to homes is only one part (and not the most critical one) of the telemedicine picture. It is clear that the NBN is not the only way to achieve the benefits of broadband, and it will not necessarily deliver higher take up or lower prices.

1.7 We find that the central premise of the NBN policy - that there is overwhelming demand for fibre to the home - is wrong. That is evident from the poor early take up, from the relatively poor response to the Inquiry, and from extensive evidence that many stakeholders are not interested or engaged.

1.8 The single most striking conclusion from this inquiry is that there were very few persuasive examples given of applications which actually require the speeds that the NBN will deliver. This was so across a wide range of sectors including telemedicine, education, business and government.

1.9 A related point was the failure to demonstrate the need for this speed to 10 million premises - as opposed to a rollout targeted to a much smaller number of key institutions such as schools, hospitals and libraries.

1.10 There was significant evidence to the Committee pointing to better approaches than the NBN - such as targeting rapid improvements to black spots, or targeting higher speeds to key institutions.

1.11 Finally, we were struck by some of the very nasty side effects of the Rudd-Gillard Government's NBN policy. In particular, by establishing a government owned monopoly, this policy is suppressing competition and handing enormous power to NBN Co's management team. The likely consequence - prices will be higher and take up lower than under a competitive market structure.

- 1.12 Coalition Members thank all of those who made submissions to and appeared before the Committee and those who hosted demonstrations and site visits. We also thank the Committee staff.

## 2. The wrong kind of inquiry at the wrong time

### a. A highly political exercise – after the decision was taken

- 1.13 This inquiry was established following a reference by Infrastructure Minister Anthony Albanese in late 2010. The terms of reference were essentially a laundry list of possible benefits that the NBN might offer. It was designed to be a political exercise, drumming up supportive testimony in favour of the NBN and resulting in a feel-good report offering support for the rollout of the NBN.
- 1.14 To be meaningful, this inquiry should have been conducted before the Rudd government took the decision to spend \$43 billion on the NBN. There is little point in investigating the benefits to be secured from the NBN over eighteen months after the decision has been taken. The clear aim of this inquiry was to generate political support for the NBN.
- 1.15 The Labor controlled committee set out to obtain supportive submissions from as many people and organisations as possible. Given that the NBN is a project involving very large expenditure – in excess of \$50 billion – it is not difficult to generate a significant number of submissions from those expecting to benefit.
- 1.16 The Committee secretariat sought submissions from a range of interested parties – many of them arms or creatures of government. Of 235 organisations which provided submissions, 54 were local councils and their umbrella organisations and a further 16 were Regional Development Authorities (RDAs).<sup>1</sup>
- 1.17 It is worth considering in more detail the evidence provided by one RDA, in Tasmania. Like all RDAs, its funding comes from the Commonwealth Government.<sup>2</sup>
- 1.18 The Tasmanian RDA was very supportive of the NBN. Its submission cited a range of benefits to be obtained. Under the heading ‘Impacting On Regional Economic Growth And Employment Opportunities,’ there were

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1 <<http://www.aph.gov.au/house/committee/ic/NBN/subs.htm>> accessed 13/8/11.

2 *Committee Hansard*, Launceston, 10 March 2011, p.37.

nine such benefits, including adding to the liveability of a region, enabling employees to work remotely, increasing market opportunities and facilitating the emergence of industries that leverage from IT and exposure to global markets, such as animation/education and software development.<sup>3</sup>

- 1.19 When asked how they came up with the material in the submission, witnesses from RDA Tasmania stated, 'Through consultation.'<sup>4</sup> On further questioning, it emerged that a survey about the NBN sent to 1500 stakeholders had received two responses.<sup>5</sup>
- 1.20 Naturally RDAs will argue for extra investment to benefit their region, and Coalition members make no criticism of the Tasmanian RDA or any other witness. However, the public policy issue is whether the Rudd Gillard Government's \$50 billion NBN is the most cost effective and sensible way to upgrade Australia's broadband infrastructure; in considering that question it is not particularly enlightening to know that a government funded RDA supports it, whereas the tangible evidence from the low response rate to the survey is rather more enlightening.

## b. Should have been a cost benefit analysis

- 1.21 Seeking to assess the benefits of a project such as the NBN, without a consideration of the costs, is a fairly pointless exercise.
- 1.22 As witnesses from the Department of Finance stated, cost must be a consideration in any evaluation:

**Mr Archer:** ...If you were making a decision about what to put in place today and that was a significant amount of money, as this is, then you would want to look at making a choice around the technology that arguably demonstrated the greatest benefit into the future so that you could continually leverage and build on that.

**Mr FLETCHER:** Does cost come into that consideration as well?

**Mr Archer:** Of course it would have to be a factor.<sup>6</sup>

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3 RDA Tasmania, Submission 113, pp 4-5.

4 *Committee Hansard*, Launceston, 10 March 2011, p.35.

5 *Committee Hansard*, Launceston, 10 March 2011, p.36.

6 *Committee Hansard*, Canberra, 27 May 2011, p 43.



- 1.23 The stated policy of the Rudd-Gillard government in relation to major infrastructure projects is that there should be a cost-benefit study before a decision is taken.
- 1.24 In conducting this inquiry, the Committee should have made an assessment of the benefits of the NBN and weighed them up against the costs. Unfortunately, this approach was specifically ruled out, despite it being proposed by Coalition members.
- 1.25 This Committee is not alone in having its work so circumscribed. As Infrastructure Australia notes in its submission, the Rudd Government's *Nation-Building Funds Act 2008* specifically excluded Infrastructure Australia from conducting a cost benefit study of the NBN, notwithstanding that it has this responsibility in relation to other major infrastructure projects it considers.<sup>7</sup>
- 1.26 As a result of the limitations on the Committee's working methods, this inquiry was conducted in an Alice i Infrastructure Australia, Submission 10, p 2n Wonderland world. Its terms of reference asked the Committee to consider the optimal capacity and technological requirements of the network, but the Committee was prevented from considering cost.
- 1.27 Some argue that cost benefit analyses cannot be conducted in relation to a project like the NBN. However, many witnesses before the Committee acknowledged that it would be feasible to conduct a cost benefit analysis. For example, Mr David Jackson, Manager Economic Development, Brisbane City Council, spoke of the Council's work in quantifying the benefits from a broadband network rollout the Council had been planning.
- Mr FLETCHER** – In the work you have done in determining some of the benefits of building a network – for example, you talked about reduced travel time and so on – can we take it from that that it is your view that it is possible to itemise and indeed quantify the benefits of building a new network and then compare that against the cost of building such a network?
- Mr Jackson** – We have done a lot of work in that space within the constraints on our ability to apply resources to the task. What is clear is that there are some quantifications that can be done....<sup>8</sup>
- 1.28 Mr Jackson agreed that it is not impossible to carry out a cost benefit analysis of a broadband network rollout.

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7 Infrastructure Australia, Submission 10, p 2.

8 *Committee Hansard*, Brisbane, 18 March 2011, pp.9.

**Mr FLETCHER** – You would not accept the proposition that it is simply impossible to compare the costs with the benefits of a broadband network.

**Mr Jackson** – I think we can go some way down that track.<sup>9</sup>

- 1.29 Similarly, Dr Tim Williams, who has carried out a major study into broadband in Australia and Britain at the request of Huawei, told the Committee that it is feasible to conduct a cost-benefit study of broadband infrastructure.

**Mr FLETCHER:** What is your perspective on the way that the networks and their benefits might be assessed for public policy purposes? You have given us some very interesting, tangible examples of cost savings. Do you believe that it is possible to construct an economic case that is based upon those kinds of savings or other benefits?

**Dr Williams:** Yes. There are some established principles around doing that. It is interesting in the UK, and it is something worth looking at. The Treasury has a Green Book appraisal process. I am sure you have similar here, but probably not quite the same. It is worth looking at because it looks at some of the externalities that are claimed from investments. It is very rigid about that. We need professional scepticism about this, but at the end of the day I think it can be proven. There are some established ways of doing that.<sup>10</sup>

- 1.30 The Business Council of Australia argued that there should be a cost-benefit analysis conducted before the decision to build the NBN is taken.

The BCA continues to advocate for the NBN to be subjected to a cost-benefit analysis to demonstrate it is the best way forward for the development of the communications sector. It stands to reason that if alternative industry models can provide broadband services to consumers and businesses at a lower cost it will result in higher take-up and use, with greater flow-on benefits.<sup>11</sup>

- 1.31 As the US senator Everett Dirksen once said, 'A billion here, a billion there, pretty soon it adds up to real money.' In anybody's language, the Australian people are spending real money on the NBN. But we have no evidence quantifying the benefits to be received – and this Inquiry did not fill this gap.

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9 *Committee Hansard*, Brisbane, 18 March 2011, pp.9.

10 *Committee Hansard*, Sydney, 29 April 2011, p 16.

11 Business Council of Australia, Submission 207, p 3.

### 3. Majority Report

1.32 Given the nature of this exercise, it is unsurprising that the Committee's Majority Report gives a glowing endorsement of the NBN.

1.33 The Majority Report repeatedly cites applications which require speeds very much lower than the NBN is being engineered to deliver. To take three examples:

- At paragraph 3.53 there is a discussion of the remote home monitoring application developed by Intel-GE Care used in the Hunter Nursing trial last year – with no reference to the fact that the required speed for this system is 512 Kbps (one two hundredth of the NBN's 100 Mbps)<sup>12</sup>
- At paragraph 5.28 and following there is a discussion of 'smart grids' – that is, electricity distribution networks containing 'smart meters' at the customer end which feed back data about electricity usage in real time. Smart meters use quite limited bandwidth, but this fact is buried deep in paragraph 5.28: '...individual smart meters do not require high bandwidth in themselves...'
- The discussion of agricultural sensors at paragraph 5.35 and following fails to disclose that the data requirements for such sensors are quite low. Evidence from Mr Robert Walker of Agforce is cited, but the Majority Report fails to note that Mr Walker agreed that the bandwidth requirements are low and it is general availability not speed which matters.<sup>13</sup>

1.34 Coalition Members note that the Majority Report conspicuously fails to get to grips with the central question: how can we be sure that there will be substantial take up of services on the NBN? This is critical financially: unless the NBN achieves the projected take up, it will not achieve its revenue targets and taxpayers will be stuck with a hugely loss making venture.

1.35 But it is just as important a question when testing the public policy objective of the NBN: to drive broadband take up so as many Australians as possible can capture the benefits of high speed broadband services. There is very little value in having a widely available high speed network if only a small proportion of the population connects because, for example, the retail prices are too high.

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12 *Committee Hansard*, Sydney, 29 April 2011, p.45.

13 *Committee Hansard*, Brisbane, 18 March 2011, p.43.

- 1.36 The policy premise of the NBN is that by 2021 around 8.5 million Australian households will purchase services over the network, overwhelmingly for purposes of communication and entertainment. Then it is assumed that there will be spin off benefits in areas like health, education, e-commerce, regional development and so on – all of the various elements of the terms of reference of this inquiry.
- 1.37 Of course, the Coalition has many well known objections to the model: but even those who are supporters of the model would presumably wish to use an inquiry like this to test its internal logic. Yet the Majority Report has virtually nothing to say about how, commercially, take up by 8.5 million households is to be achieved. It limits itself to some motherhood recommendations in chapter 11 about a ‘comprehensive engagement strategy’ and using RDAs in ‘facilitating local community engagement.’

#### **4. NBN is poorly planned and implemented**

- 1.38 The first conclusion which emerges from this Inquiry is that the NBN has been poorly planned and implemented. The evidence we received suggests that:
- There was little planning prior to the 2009 announcement that the Rudd Government was abandoning its fibre to the node network and building a fibre to the premises network
  - Key network and rollout decisions are driven by political considerations
  - There is poor communication with industry
  - The degree of preparation by Commonwealth Departments is unimpressive.

##### **a. Little Planning Prior to 2009 NBN Announcement**

- 1.39 In early 2009 the Rudd Government abruptly changed its broadband policy – from a fibre to the node rollout costing \$4.7 billion to a fibre to the premises rollout costing \$43 billion. Evidence to the Committee suggests that little planning work was done prior to this decision, and little expert advice was sought.
- 1.40 The department with primary responsibility for broadband policy is the Department of Broadband, Communications and the Digital Economy. This Department informed the Committee that there was no formal

analysis done, before the decision in early 2009 to change from a fibre to the node rollout to a fibre to the premises rollout, as to the benefits that would be obtained.

**Mr FLETCHER:** As part of that, was there work done of the kind that is included in your submission as to the sorts of things that could be delivered over fibre to the premises that could not be delivered over fibre to the node?

**Mr Heazlett:** The decision per se was not one that was consciously addressing the relative benefits of a fibre-to-the-node approach and a fibre-to-the-premises approach. The costs or potential costs involved in pursuing a fibre-to-the-node program were of a similar order of magnitude to the costs identified in relation to fibre to the premises. Given that and the conclusive views of a wide variety of people that fibre to the premises was far preferable and offered far greater potential for the future than fibre to the node, the government decided to go to the fibre-to-the-premises approach.<sup>14</sup>

- 1.41 Australia's public universities share ownership of a high speed research network, AARNET, which is a major repository of expertise in high speed broadband. However, AARNET was not consulted before the 2009 decision.

**Mr FLETCHER:** I am interested, given your organisation's expertise in this field, in whether you were asked to provide advice to government in advance of the decision announced in April 2009 to build a National Broadband Network?

**Mr Hancock:** Not that I am aware of.<sup>15</sup>

- 1.42 In hearings before the Committee, the Department of Health and Ageing not able to provide the Committee with any indication of what advice was provided by the Department to the Government in advance of its 2009 decision on the NBN. It took this question on notice. In its subsequent response to the Committee, the Department could cite no advice given any later than 2006.<sup>16</sup>
- 1.43 A similar lack of planning appears to have characterised the Tasmanian rollout.

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14 *Committee Hansard*, Canberra, 27 May 2011, p 57.

15 *Committee Hansard*, Canberra, 27 May 2011, p 29.

16 Department of Health and Ageing, *Submission 212.1*, p.1.

**Mr FLETCHER** – Has the Tasmanian government done any survey work or projections on the likely appetite for services over the NBN?

**Mr McGee** – No, not that I am aware of.<sup>17</sup>

- 1.44 Nor it seems was consultation conducted with many relevant experts before the decision was made. This point was made rather crisply in a submission to the Committee from the Australasian Telehealth Society.

While telehealth has often been proposed as a key justification for proceeding with the National Broadband Network, the views of the Australian telehealth community have not previously been sought, nor a comprehensive case for telehealth on the NBN presented.<sup>18</sup>

## b. Politics driving rollout decisions

- 1.45 The Tasmanian Chamber of Commerce and Industry was very critical of the decision to choose three regional towns as the first location for NBN's roll out in Tasmania, stating that this was for political reasons.

The three that they chose, we believe were totally wrong. They were chosen for purely political reasons. All three were marginal seats.<sup>19</sup>

- 1.46 Mr Wallace of the TCCI stated that his organisation would have preferred a higher priority to be given to Hobart and Launceston, so as to secure productivity gains. He noted that these cities already have some optical fibre infrastructure.<sup>20</sup>

- 1.47 With political imperatives driving rollout decisions, there appears to have been little opportunity given to local communities to engage in advance planning to maximise the opportunities from the NBN. Dorset Council for example, covering the Tasmanian town of Scottsdale, received little advance notice that it would be a first release site.

**Mr FLETCHER** – When did Dorset Council first learn that Scottsdale was to be an initial site for NBN?

**Mrs Mercer** – I think it was sometime between July and September 2009.

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17 *Committee Hansard*, Hobart, 11 March 2011, p.70.

18 *Australasian Telehealth Society*, Submission 101, p 1.

19 *Committee Hansard*, Hobart, 11 March 2011, p.22.

20 *Committee Hansard*, Hobart, 11 March 2011, p.16

**Mr FLETCHER** – So it was not on the basis of a proposal or a submission the council made.

**Mrs Mercer** – No.

**Mr FLETCHER** – You were just notified of that.

**Mrs Mercer** – We were, yes.<sup>21</sup>

- 1.48 Similarly in Townsville, there was no advance notice that Townsville would be a first release site.

**Mr Hayward**...the first we heard as a council that we were a first release site was the press release. That did catch us by surprise. As a result of that, we have had to change how we do some of our internal operations, reallocate resources to actually take advantage of the opportunity that presents itself.<sup>22</sup>

### c. Poor communication with industry

- 1.49 NBN Co appears to have done a poor job of communicating with industry. Mr Jeremy Moffat, Managing Director, North Queensland Telecom, a small ISP, expressed this concern:

**Mr Moffat** – I probably would not say that I feel like I am shut out. I think that the small ISP area in general has just been a little bit overlooked.<sup>23</sup>

- 1.50 Mr Moffat explained that he knew little about what was to happen locally.

**Mr Moffat** – I do not know anything about NBN locally other than it is going to be working out of Aitkenvale. I do not know how to get access to it. I do not know what my –

**Mr SYMON** – There is not the information there?

**Mr Moffat** – Yes.<sup>24</sup>

- 1.51 In Tasmania the TCCI told the Committee of the Tasmanian business community's frustrations regarding the lack of information provided to business.

**Mr Wallace** – In the last eight months we have had no connection with Tasmanian NBN Co. or NBN Co. simply because we became frustrated, as did a lot of other organisations. The information we

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21 *Committee Hansard*, Launceston, 10 March 2011, p.5.

22 *Committee Hansard*, Townsville, 19 April 2011, p. 14.

23 *Committee Hansard*, Townsville, 19 April 2011, p.23.

24 *Committee Hansard*, Townsville, 19 April 2011, p.23.

know is on the government website, so we can see where the rollout is. We had to be proactive. We had no-one coming to us.<sup>25</sup>

#### d. Unimpressive Preparation for NBN by Commonwealth Departments

1.52 It was evident that key government departments so far have done little work on leveraging the NBN rollout. For example, when the Department of Innovation, Industry, Science and Research told the committee about the work of its Enterprise Connect program in regional areas, it emerged that this work has not been coordinated with the NBN rollout.

**Mrs PRENTICE:** Are you matching this with the rollout? Have you targeted Scottsdale, for example, and are you now targeting Armidale?

**Mrs Zielke:** Not particularly in that regard...<sup>26</sup>

1.53 The Department of Finance told the committee that there was no government wide policy on teleworking.

**CHAIR:** ... Is there a broader government agency policy on teleworking or does it happen ad hoc on individual arrangements? Do you know what the status is more broadly?

**Mr Archer:** Certainly it does happen on an ad hoc basis. Individual agencies have positions on teleworking.<sup>27</sup>

1.54 The Department of Broadband, Communications and the Digital Economy was unable to give any examples of Australian government departments communicating with clients via videoconferencing.<sup>28</sup> When asked about its responsibilities in relation to driving government usage of information technology, DBCDE said it was not doing this work itself:

**Mr SYMON:** Is it your department that is working on this transition to enable that to happen, or is it done across a number of departments?

**Mr Rizvi:** It is probably fair to say that we are something of a catalyst rather than doing the work ourselves. What we are doing is encouraging individual departments where these opportunities arise, particularly linked to the NBN, to consider and test them.<sup>29</sup>

25 *Committee Hansard*, Hobart, 11 March 2011, p.25.

26 *Committee Hansard*, Canberra, 6 July 2011, p 8.

27 *Committee Hansard*, Canberra, 27 May 2011, p 39.

28 *Committee Hansard*, Canberra, 27 May 2011, p 55.

29 *Committee Hansard*, Canberra, 27 May 2011, p 55.



1.55 Nor did the Department of Regional Australia, Regional Development and Local Government inspire confidence about the work being done to capture the claimed economic benefits to regional Australia from the NBN.

1.56 When told that the Committee was interested in what appears to be a significant presence of home based businesses in regional areas, their response was:

**Mr Atkinson:** As you said, there is no detailed data on that.<sup>30</sup>

1.57 This became a recurring theme in the Department's answers:

**Mr FLETCHER:** On page 5 of your submission you quote some data about the lower rate of internet and broadband take-up in regional Australia. How much of that is due, in your view, to lower incomes and therefore a lower capacity to pay in regional Australia? The heading is 'Current internet access and use in regional Australia'.

**Mr Atkinson:** We actually have not done any detailed analysis of what has driven those statistics. Those are ABS statistics.<sup>31</sup>

1.58 When asked about a statement in their submission expressing concern that some areas may not be broadband ready, and what the consequences of not being 'broadband ready' might be, the answer was:

**Mr Atkinson:** I am not certain. I have not read the report.<sup>32</sup>

1.59 Nor it seemed could the Department provide any statistical evidence:

**Mr FLETCHER:** You talk about the fact that quite a number of the RDAs have identified improved information technology access as a priority. Clearly, from first principles, that make sense as a thing to identify. I am interested to know whether there is any survey data or other data that you are aware of that any of the RDAs have gathered to support or underpin those recommendations that they have made.

**Mr Atkinson:** I am sorry; I do not have the detail of the recommendations underpinning each of the individual RDA plans.<sup>33</sup>

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30 *Committee Hansard*, Canberra, 27 May 2011, p 45.

31 *Committee Hansard*, Canberra, 27 May 2011, p 46.

32 *Committee Hansard*, Canberra, 27 May 2011, p 47.

33 *Committee Hansard*, Canberra, 27 May 2011, p 47.

- 1.60 Nor had the Department reviewed the outcomes from earlier regional communications initiatives in Australia. When asked if they had had 'the opportunity to go back and look at previous efforts to improve communications infrastructure in rural Australia,' the following exchange resulted:

**CHAIR:** And capture a bit of an overall picture over time of communications across regional Australia – not the particular policies but the history of it and where it is that?

**Mr Atkinson:** We have not done a detailed analysis of the communications history.<sup>34</sup>

- 1.61 The Western Australian Internet Association highlighted the poor use of on line communications by government agencies like Centrelink and the Australian Taxation Office today.

Having said that, there is certainly ample opportunity for the government to engage in the internet today. Organisations like Centrelink and the ATO really have quite rudimentary engagement with the internet at the moment and they could do much more.<sup>35</sup>

## 5. NBN is oversold: many claims cannot be substantiated

- 1.62 The second conclusion from this inquiry is that many of the key claims which have been made about the NBN by the Rudd-Gillard government are overblown and cannot be substantiated.

### a. Telemedicine claims are overblown

- 1.63 Telemedicine stands out as an area where the claims made for the benefits the NBN will deliver are overblown. The NBN will not stimulate health and telemedicine without a great deal of additional work. Further, there is a risk that the focus on the NBN will divert attention from higher priorities in this field.
- 1.64 Dr Steve Hambleton, Vice-President of the Australian Medical Association, highlighted the many barriers which must be overcome before there is widespread adoption of e-health.

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34 *Committee Hansard*, Canberra, 27 May 2011, p 47.

35 *Committee Hansard*, Perth, 5 May 2011, p 27.

**Mr FLETCHER** – The impression I have from you is that there are non-network barriers to the efficient exchange of information between all the different elements of the health system. There is a lack, for example, of a central software package that would allow the routine exchange of information about a patient from, for example, a GP to a specialist or a GP to a radiologist to allow the scan to occur, and then to the specialist to do the consultation. Is that a fair summary?

**Dr Hambleton** – Absolutely. We have just developed in Australia the unique patient identifier, which is step one. The e-health agenda is talking about this magic connectivity that is going to allow patient controlled access. All of these things need to be put in place so we can actually use the pipes that are going to go on the ground.

**Mr FLETCHER** – So NBN, of itself, is not going to solve that particular problem; you need a separate attempt to tackle that?

**Dr Hambleton** – Correct.<sup>36</sup>

1.65 This point was expanded upon in the AMA's submission.

Further, the delivery of healthcare using high speed internet is also contingent on the development and implementation of a range of eHealth tools. For example, an electronic medical record that links reliable and relevant medical information across healthcare settings would allow treating medical practitioners to access patient information quickly to inform their clinical decisions. Other eHealth tools like ePrescribing and discharge summaries could be made available across the healthcare sector via interoperable systems.<sup>37</sup>

1.66 A similar point was made by the Australasian Telemedicine Association.

The NBN will remove some technical barriers to new models of health care which will incorporate telehealth as a means of delivery of health care services, not simply consultation. However, the slow uptake of eHealth technologies over the last few decades has shown that such paradigm shifts are very difficult to implement in the health system. There will need to be a national strategy for facilitating and encouraging the changes to health care

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36 *Committee Hansard*, Canberra, 4 March 2011, pp.21-22.

37 Australian Medical Association, Submission 75, p 2.

delivery which will justify the NBN on the basis of its ability to deliver healthcare services.<sup>38</sup>

1.67 National ICT Australia took a similarly cautious perspective.

However, non technical barriers, such as billing for e-Health services for example, will also need to be addressed. It is important to understand that while pervasive broadband may remove some blockages, culture and process must be able to take advantage of what the technology allows.<sup>39</sup>

1.68 Consumers e-Health Alliance also argued very forcefully that the NBN is not a solution to e-Health in itself.<sup>40</sup>

## b. It's not a high speed research network & does not underpin the SKA

1.69 The Department of Innovation, Industry, Science and Research (DIISR) stated that the NBN would support and complement investments in the Australian research and education network (AREN).<sup>41</sup>

The NBN offers sustainable solutions for those areas that the AREN is still striving to reach.<sup>42</sup>

1.70 It is important to be clear that the NBN is not a research network. As AARNET Chief Executive Chris Hancock explained to the Committee, there is clear distinction between a consumer broadband network like NBN and a high speed research network like AARNET (the major component of the Australian Research and Education Network or AREN).

**Mr Hancock:** ... every modern economy has a separate research network like AARNet. They are called NRENs, national research and education networks – and in our submission we outlined that there are 119 NRENs around the world – and they are essential for the development of the internet in each of those countries well beyond the home.<sup>43</sup>

1.71 Mr Hancock expanded on this point in later evidence.

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38 Australasian Telehealth Association, Submission 101, p 12.

39 National ICT Australia, Submission 198, pp 10-11.

40 Consumers e-Health Alliance, Submission 201.1, p 4.

41 *Committee Hansard*, Canberra, 4 March 2011, p 93.

42 Department of Innovation, Industry, Science and Research, Submission 219, p 36.

43 *Committee Hansard*, Canberra, 27 May 2011, p 25.

**Mr FLETCHER:** I think what you are putting to us is that there is a clear distinction to be drawn between, on the one hand, a research network which is very high bandwidth to, at most, a few hundred or a few thousand locations and then, on the other hand, what you might call a retail broadband network designed to offer fast but an order of magnitude lower speeds than yours to millions of premises.

**Mr Hancock:** That is correct.<sup>44</sup>

1.72 In this light it is difficult to understand DIISR's statement in its submission about the role of NBN in supporting research in areas where the AREN (of which AARNET is the largest component) does not have a presence.

1.73 DIISR also argued that the NBN was of benefit to Australia's bid for the 'square kilometre array' (SKA) – the proposed international research telescope which Australia is bidding to secure.

Areas of research that rely increasingly on the gathering and synthesis of very large data sets, including those collected through sophisticated research instruments, have the potential to benefit from the NBN. A clear example is radio astronomy research, through the impact on the Square Kilometre Array (SKA) bid described further in this chapter.<sup>45</sup>

1.74 Ms Anne-Marie Lansdown told the Committee:

Under the NBN rollouts in Western Australia through the Regional Backbone Blackspots Program we will be significantly supported in our bid for the square kilometre array by providing the connectivity support in the viability of our bid.<sup>46</sup>

1.75 In a subsequent hearing, AARNET Chief Executive Chris Hancock explained that the connectivity is being provided by AARNET and not by NBN:

**Mr Hancock:** ...the area [where the SKA Pathfinder is being built] is called Boolardy Station and it is a remote outpost 400 kilometres north-east of Geraldton. AARNET has managed the build of the fibre from Geraldton to Boolardy on behalf of the CSIRO and there are about 30 [kilo]metres to go of the 400 kilometres as of today. When that is connected, it has to be in a remote area, as you know, because of low noise levels and any other signals. That is fibre that

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44 *Committee Hansard*, Canberra, 27 May 2011, p 29.

45 Department of Innovation, Industry, Science and Research, Submission 219, p 37.

46 *Committee Hansard*, Canberra, 4 March 2011, p.93.

is owned by CSIRO and managed by AARNet. The next leg of that is from Geraldton down to Perth, which is part of five blackspots that were announced. AARNet will have an IRU – an ownership – over that link, as well as NextGen and the NBN. That will give us the ability to connect to there and then from Perth to Geraldton and from Perth across to Sydney we run that on the AARNet backbone. So, basically, we will be providing very high capacity.<sup>47</sup>

- 1.76 When DIISR appeared before the Committee again, Ms Lansdown agreed that the telecommunications infrastructure to support the SKA was already in place.

**Mr FLETCHER:** Just to make sure I am understanding this correctly, if the link from Geraldton has been built and the rest of it uses existing backbone, if there were no further expenditure on the NBN would the telecommunications infrastructure which is required to support the SKA be there?

**Ms Lansdown:** If you assume that we are going to compress the data before we move it from Perth and the most likely path for that is the AREN path, which is a 10-gigabit network, the answer is yes.<sup>48</sup>

- 1.77 Coalition Members therefore do not accept the argument that the NBN is a requirement for the SKA to proceed.

- 1.78 Ms Lansdown also agreed that there was no requirement to build 10 million fibre optic connections to homes (the major contributor to the cost of the NBN) to support the SKA.

**Mr FLETCHER:** You are not putting it to us, so I presume that the 10 million connections in the access network are required to support the SKA?

**Ms Lansdown:** No, I do not think I have.<sup>49</sup>

### c. NBN is not the only way to achieve the benefits of broadband

- 1.79 The Rudd-Gillard Government has sought to give the impression that there are only two positions you can take: you either support the NBN and its network design, or you oppose broadband. Of course, that is nonsense. There are many alternative, cheaper network designs and funding

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47 *Committee Hansard*, Canberra, 27 May 2011, p 27.

48 *Committee Hansard*, Canberra, 6 July 2011, p 3.

49 *Committee Hansard*, Canberra, 6 July 2011, p 3.

arrangements which deliver the benefits of high speed broadband but at much lower cost to the taxpayer than the NBN.

- 1.80 One example is the approach being used in Britain. This was explained by Dr Tim Williams, including the balance between private sector funding and public spending.

**Dr Williams:** The UK position is that by 2014 two-thirds of the UK residents will receive fibre to the premises. There is a caveat, which is that half that is currently copper for the last mile, as it were, but will be replaced incrementally. That is by largely BT-private sector – which is a privatised utility from 25 years ago – and other private sector deliverers working there, so two-thirds is effectively a private sector result. The final third is where the problem is in most parts of the world, it seems to me, and that is now requiring special attention by the central government who are putting in, at the moment, half a billion dollars to try to incentivise deals between the local communities and the private sector to try to make that happen. It is largely fibre based that they are going for, except with the final third the government has said that it will be technologically neutral, that is, that it will support fibre to a community centre, as it were, through the BT route and then, beyond that, whatever can be achieved in a mix of technologies and they will put some incentive money into that.<sup>50</sup>

#### d. NBN will not automatically deliver higher take up or lower prices

- 1.81 Some submissions assumed that by delivering higher speeds NBN will achieve higher broadband take up. A good example was the citing by the Department of Broadband, Communications and the Digital Economy of e-government in Denmark.

Denmark is considered by the OECD to among the best in Europe in terms of the sophistication in e-government services with 84 per cent of the 20 basic services for citizens on line. This is supported by Denmark's performance as a leader in terms of broadband penetration and frequent internet users.<sup>51</sup>

- 1.82 DBCDE is evidently arguing that the best way to emulate Denmark's performance in e-government is to increase broadband penetration in Australia towards the levels which apply in Denmark. That argument is

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50 *Committee Hansard*, Sydney, 29 April 2011, pp 14-15.

51 Department of Broadband, Communications and the Digital Economy, Submission 215, p 23.

plausible – but DBCDE provides no evidence for its assumption that rolling out the NBN will be effective to increase broadband penetration. Denmark offers no support for DBCDE's assumption: OECD statistics show that as at 30 June 2010, of the 37.7 broadband services per 100 persons in Denmark, only 4.7 are fibre, with the clear majority being DSL.<sup>52</sup>

- 1.83 Other submissions assumed that NBN will deliver lower broadband prices. DIISR was one example.

Currently, many regional and remote SMEs have limited growth potential due to a slower uptake of online technology than in metropolitan areas. This is mainly due to the difficulty in obtaining connection to these services at a reasonable price. The NBN has the potential to break down this barrier and allow an increased uptake of online technology.<sup>53</sup>

- 1.84 DIISR may be right that high broadband prices are holding back take up in rural and remote Australia. But there is no basis for its assumption that NBN will deliver lower broadband pricing.

### e. Benefits will not come automatically

- 1.85 Many witnesses made the point that the NBN is not a 'silver bullet'. The benefits that its champions claim will not occur automatically as a result of building the NBN. Industry body Communications Alliance made this point clearly.

**Mr Stanton:** As I said, the network in itself will not achieve everything that we are looking for in terms of digital economy development, because unless there is a reason to connect and to use it at high speed people will not. They will need applications and they will need the opportunity to take advantage of what the network can provide, but at the end of the day it is a layer 2 network. The magic is above layer 2.<sup>54</sup>

- 1.86 Dr Tim Williams pointed out that the NBN will not, of itself, lead to the delivery of government services over the internet.

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52 OECD Broadband Portal, [http://www.oecd.org/document/54/0,3746,en\\_2649\\_34225\\_38690102\\_1\\_1\\_1\\_1,00.html](http://www.oecd.org/document/54/0,3746,en_2649_34225_38690102_1_1_1_1,00.html), accessed 19/8/11.

53 Department of Innovation, Industry, Science and Research, Submission 219, p 18.

54 *Committee Hansard*, Sydney, 29 April 2011, p 34.



The second thing that is very much in the report is that a lot of this is not automatically going to happen as a consequence of just providing a highway. It is really about trying to make sure that at least what is under public control, either at central or local government, really understands what this can do to services that they deliver.<sup>55</sup>

## f. Oversold: the gap is not as great as is claimed

1.87 Part of the case for building the NBN is that Australia's broadband infrastructure today is hopelessly inadequate. As evidence to the Committee demonstrated, the picture is more complex. It is clear that many residential customers do not get adequate fixed line broadband. But many do; and many businesses, hospitals, schools, universities and other institutions already have high bandwidth connections.

1.88 This point was made by DBCDE:

**Mr Rizvi:** As you would be aware, Mr Fletcher, quite a large proportion of hospitals are probably already connected to fibre, and schools to a lesser degree. Large businesses have often invested in fibre.<sup>56</sup>

1.89 A good summary of the position in the education sector was provided by the Australian Information and Communications Technology in Education Committee (AICTEC).

Broadband connectivity within the education sector is improving. The higher education sector is generally well served by a high speed broadband network. The vocational education and training (VET) sector has a high degree of fibre connectivity but a wide range of line speeds ranging from less than 4 megabits per second (Mbps) to over 100Mbps. An increasing proportion of schools are connected to fibre and line speeds are improving but they remain varied, ranging from less than 4Mbps to over 100Mbps.<sup>57</sup>

1.90 AICTEC reported that a survey by the Commonwealth Department of Education found that 63.4% of schools (there are approximately 10,000 in Australia) had a fibre connection in 2010.<sup>58</sup> This suggests that a program to

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55 *Committee Hansard*, Sydney, 29 April 2011, p.13.

56 *Committee Hansard*, Canberra, 27 May 2011, p 57.

57 Australian Information and Communications Technology in Education Committee, Submission 124, p 2.

58 Australian Information and Communications Technology in Education Committee, Submission 124, p 10.

prioritise connecting all other schools to fibre could be carried out relatively quickly and cheaply.

- 1.91 DBCDE presented evidence that 4.4 million premises in Australia could receive speeds of at least 9.4 Mbps from ADSL2+ and a further 3.66 million premises could receive speeds of at least 3 Mbps.<sup>59</sup> Its submission also stated that a speed of 4-5 Mbps was sufficient for high definition video using MPEG-4 compression.<sup>60</sup>
- 1.92 DBCDE were asked to provide a supplementary submission updating these numbers by including the number of Australians who can receive a cable service from Telstra or Optus, given that these networks are capable of delivering speeds of up to 100 Mbps.<sup>61</sup> DBCDE declined to provide this data.
- 1.93 Some witnesses who appeared before the Committee have high speed broadband connections today. For example, Mr Tony Clark of Rising Sun Pictures, a film and television animation visual effects company in Adelaide, told the Committee of his company's very impressive achievements in delivering animation products all around the world using the internet. Mr Clark explained that Rising Sun already has a fibre connection.

**Mr FLETCHER** – I want to check a couple of things. The impression I got from what you have said is that to date you have been able to connect with your customers on fibre or other high-bandwidth networks – is that correct?

**Mr Clark** – That is correct but that is principally because we have built them ourselves.

**Mr FLETCHER** – Presumably though it made economic sense for you to do that?

**Mr Clark** – Bearing in mind that we were bootstrapped by a significant investment by the state government of South Australia which enabled us to build that, yes, absolutely.<sup>62</sup>

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59 Department of Broadband, Communications and the Digital Economy, Submission 215, p 91.

60 Department of Broadband, Communications and the Digital Economy, Submission 215, p 93.

61 Telstra's and Optus' networks pass respectively 2.5 million and 1.4 million homes, and are capable of delivering speeds of 100 Mbps. Telstra already delivers these speeds over its cable network in Melbourne; in other locations these speeds could be delivered with relatively minor upgrades.

62 *Committee Hansard*, Adelaide, 4 April 2011, p 23.

## 6. NBN's central premise – overwhelming demand for FTTH – is wrong

- 1.94 The third conclusion from this inquiry is that the NBN plan is based on a false premise. There is no overwhelming demand for high speed fibre to the home broadband. On the contrary, demand is weak and interest is low. This appears related to the fact that very few applications have been demonstrated which actually need the speeds of 100 Mbps or 1 Gbps which the NBN is being engineered to deliver.
- 1.95 In the limited number of cases where we saw applications which could justify higher speeds than can be delivered over today's networks, they were not applications which would typically be delivered to homes. In other words, there may be a case to connect fibre to key institutions such as schools. However, no case has been made to connect fibre to around 10 million residential premises in Australia.

### a. Troubling indicators of weak demand

#### Disappointing early takeup

- 1.96 The Committee visited locations where the NBN has been rolled out. Take up is disappointingly low.
- 1.97 In Scottsdale, Tasmania, 70 per cent of homes have agreed to be connected to the network.<sup>63</sup> In other words, 30 per cent have declined – even though connection is free. Committee members were advised by employees of NBN Tasmania, during our discussions with them, that take-up of a paid service was only around 15 per cent. The local council has not taken a service.<sup>64</sup>
- 1.98 An Internet service provider involved in the NBN trials in Tasmania, iiNet, indicated its view that take up cannot just be left in the hands of the internet service providers.

**Mrs PRENTICE:** You mentioned and acknowledged our concerns in Scottsdale in Tasmania where there was not the take-up that we would have hoped for. Whose role do you see as promoting the importance of take-up? Is that something you as a retailer should be involved in?

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63 *Committee Hansard*, Launceston, 10 March 2011, p 4.

64 *Committee Hansard*, Launceston, 10 March 2011, p 4.

**Mr Dunstan:** I think both pillars are very important and the ability of NBN to continue to build the brand and build the education is really important. ISPs on their own will find it difficult to build the education about what, how and why of the NBN.<sup>65</sup>

### Limited number of submissions

1.99 The Committee received 235 submissions and 17 supplementary submissions.<sup>66</sup> This is a surprisingly small number of submissions for an inquiry into an infrastructure project which is supposedly addressing huge unmet demand. As a comparator, the 1996 Senate Inquiry into the sale of Telstra received 634 submissions – nearly three times as many.<sup>67</sup>

### Evidence of lack of interest

1.100 There was evidence provided to the Committee, by a range of witnesses from a number of different sectors, that small business and other sectors have little interest in or awareness of broadband and the NBN.

1.101 Philippa Forrester, Chair, McLaren Vale Grape, Wine and Tourism Association, gave evidence to the Committee about the potential impact of the NBN in her region. She commented that ‘many of the small businesses did not really think that it was going to make a difference to them.’<sup>68</sup> She added that in her experience ‘farmers generally do not even think about broadband.’<sup>69</sup>

1.102 Mr Thomas Laing, Secretary, Willunga Business and Tourism Association, gave a telling example of the lack of demand for broadband applications by small businesses in his area.

**Mr Laing** - We have a developer in McLaren Vale Mark Potter who has done an iPhone app for tourism. The uptake of that in Willunga has been very slow. People are not knocking on his door and saying, ‘Yes, yes, please.’ It is, ‘We’ll wait and see.’<sup>70</sup>

1.103 Awareness is low even in Tasmania where the NBN’s first rollouts have occurred, as Digital Tasmania noted.

65 *Committee Hansard*, Perth, 5 May 2011, p 8.

66 <http://www.aph.gov.au/house/committee/ic/NBN/subs.htm>, accessed 22/8/11.

67 [http://www.aph.gov.au/Senate/committee/ecita\\_ctte/completed\\_inquiries/1996-99/telstra/report/e01.htm](http://www.aph.gov.au/Senate/committee/ecita_ctte/completed_inquiries/1996-99/telstra/report/e01.htm), accessed 13/8/11.

68 *Committee Hansard*, Victor Harbor, 5 April 2011, p.39.

69 *Committee Hansard*, Victor Harbor, 5 April 2011, p.39.

70 *Committee Hansard*, Victor Harbor, 5 April 2011, p.50.

Awareness has been rather lacklustre outside the first three towns. NBN and fibre-optic are sort of name dropped at every opportunity by the state and federal governments, but people are not really told what that means to them and what it is going to do for them in the real world in real terms.<sup>71</sup>

1.104 RDA Tasmania also revealed that it was finding little interest from Tasmanian businesses in NBN. It had issued a survey concerning the NBN to all 1500 stakeholders in their database, across Tasmania, and obtained two responses.<sup>72</sup>

1.105 This does not suggest strong demand for or enthusiasm about the NBN. Nor does the following exchange with Mr Perkins of RDA Tasmania:

**Mr FLETCHER** – Let me put the question another way: how many businesses can you specifically identify – I am not asking for their names but the number of businesses – that you have spoken to in the last six months who have identified things that they are planning to do with an improved broadband network infrastructure?

**Mr Perkins** – I could not give you an answer.<sup>73</sup>

1.106 Take up of broadband by Tasmanian tourism businesses is low, the Committee was told by RDA Tasmania.

I think that tourism businesses historically have not been as open to getting online, whether it be a website or it be having their details stored in this database. A lot of tourism businesses are bed and breakfasts or semi-retired type arrangements, so they are happy with the status quo and they are not as interested in growing their businesses. Therefore they do not see the need to get online or to open up to multiple distribution channels.<sup>74</sup>

1.107 Nationally the picture appears similar, according to a survey recently commissioned by the federal Department of Resources, Energy & Tourism. The survey found that 84 per cent of tourism businesses had an on line presence, but only 35 per cent had online booking and payment facilities.<sup>75</sup> This suggests that e-commerce in tourism is more likely to be

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71 *Committee Hansard*, Launceston, 10 March 2011, p.20.

72 *Committee Hansard*, Launceston, 10 March 2011, p.36.

73 *Committee Hansard*, Launceston, 10 March 2011, p.37.

74 *Committee Hansard*, Launceston, 10 March 2011, p.31.

75 Department of Resources, Energy & Tourism, Submission 190.1, p 2.

stimulated by a program to assist tourism businesses with their on line transaction capabilities than by giving them higher speed access.

- 1.108 When asked about engagement by local small and medium businesses with broadband and its potential, Mr Jeremy Moffat, Managing Director, North Queensland Telecom, noted a general lack of engagement:

**Mr Moffat** – I just do not think they are. I think there is generally a lack of awareness through small business. I have attended a couple of forums where the question is continually asked: what will the NBN mean to me? What can I do that I cannot do now?<sup>76</sup>

- 1.109 The message was reinforced by Mr Peter Read, IT Consultant at the North Queensland Small Business Development Centre. He stated that small businesses had a low online presence and did not know who to approach. Without education, he did not expect their online presence to change much.

**Mr Read...** If we do not do that, I do not think there is going to be a lot of change, except that techos will be saying, 'Yes, it's faster!' <sup>77</sup>

- 1.110 A similar point was made by Mr Darren Alexander of Tasmanian ICT.

It is important to advise and educate the SME market in Australia...After all, there is no point putting a five-lane freeway between two small towns if no-one is going to drive on it.<sup>78</sup>

- 1.111 The evidence of limited interest in broadband makes Coalition Committee Members sceptical that the NBN will magically change the way small business operates. Evidence from Scottsdale, where the NBN is already operating adds to that scepticism. Small business owners appearing before the Committee were unable to point to ways in which it has changed their business operations.

**Mr FLETCHER** – I am asking you both this in your capacity as business owners and operators. Can you think of things that you are now doing differently in engaging with your customers, for example, because you have NBN or because more customers have an internet connection?

**Mrs Hall** – I cannot think of anything.<sup>79</sup>

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76 *Committee Hansard*, Townsville, 19 April 2011, p.24.

77 *Committee Hansard*, Townsville, 19 April 2011, p.30.

78 *Committee Hansard*, Hobart, 11 March 2011, p.51.

79 *Committee Hansard*, Launceston, 10 March 2011, p.17.

## b. Failure to demonstrate need for FTTH speed

- 1.112 The single most striking conclusion from this inquiry is that there were very few persuasive examples given of applications which actually require the speeds that the NBN will deliver.
- 1.113 The Committee was provided with many fascinating and encouraging examples of applications which could be delivered if there was widespread availability of high speed broadband services.
- 1.114 There was however a conspicuous lack of evidence of a need for applications needing the speeds that a FTTH network can deliver (100 Mbps) as opposed to speeds of say 10-20 Mbps which can be delivered over existing DSL and HFC networks to many Australians.
- 1.115 Some witnesses effectively argued that the applications which would require 100 Mbps are not yet known. This view was put by the CSIRO for example.

The future transformative impact of broadband communications, including internet access, is, to some extent, unknown.<sup>80</sup>

- 1.116 Coalition Members welcome the intellectual honesty of this submission. We are not persuaded however that it makes sense to spend so many billions of taxpayers' money on a venture the impact of which is unknown.
- 1.117 The failure to demonstrate specific applications requiring 100 Mbps was notable in many different fields of activity.

### Telemedicine

- 1.118 Many telemedicine examples provided to Committee did not require the speeds that NBN will deliver; often they could be readily delivered over today's networks. The Committee was provided with a good example by Intel-GE Care Innovations.
- 1.119 Dr George Margelis from Intel-GE appeared before the Committee and described a trial of health monitoring equipment, conducted in 2010, involving 50 elderly patients receiving in home nursing care from Hunter Nursing.

We delivered a little white box into their home, which for all intents and purposes was a small computer but was designed to be used by someone who did not know anything about computers.

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80 CSIRO, Submission 171, p 3.

So, the classic patient had never used a computer before in their life and had never had to worry about those sorts of things. This device spoke to them, gave them very large onscreen prompts, took them through a process of healthcare delivery and enabled them to also communicate with their healthcare provider remotely. So, the nurse sitting at her desk at Hunter Nursing could videoconference to this patient and discuss their health concerns. They could get information about their blood pressure, weight, blood oxygen, general wellbeing and actually ask the patients questions about how they felt, and it did all that quite simply.<sup>81</sup>

- 1.120 Dr Margelis was asked what speed this application requires; his answer revealed that it needs very much less than the 100 Mbps the NBN is being engineered to deliver. The required speed is 512 Kbps – that is, one two hundredth of 100 Mbps.

But at least 256K; 512K would be better. Once you start getting up to one and two megabits we actually find that the technology no longer becomes an issue and we then start hitting constraints of the hardware.<sup>82</sup>

- 1.121 For this reason, Coalition Members of the Committee deplore the fact that NBN Co claims, incorrectly, that the Intel Health Guide it is an application which requires the NBN. This claim appears in a fact sheet available on NBN Co's website, headed: 'Case Study: Healthcare - chronic illness; Remote care helps patients stay out of hospital.'

- 1.122 The fact sheet says:

As Australia's population ages, the pressure on health services to support sufferers of chronic illnesses, such as heart conditions, is on the rise. The National Broadband Network (NBN) can help alleviate some of these pressures by enabling in-home health solutions such as the Intel Health Guide. Trials show the Intel Health Guide delivers improved patient outcomes. With an NBN, these services could be delivered to homes across the country.<sup>83</sup>

- 1.123 It is notable that many submissions claimed that NBN would facilitate remote monitoring and diagnostics, for example, the submission from DIISR.

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81 *Committee Hansard*, Sydney, 29 April 2011, p.45.

82 *Committee Hansard*, Sydney, 29 April 2011, p.48.

83 <http://www.nbnco.com.au/assets/case-studies/case-study-healthcare-intel-hunter-apr-11.pdf>, accessed 15/8/11.



Medical devices, services and software for remote prevention, monitoring and treatment interventions over the NBN could include blood pressure, glucose level, heart rate, weight, incontinence and falls monitors and chronic disease treatments (e.g. for dialysis and cardiac conditions).<sup>84</sup>

- 1.124 These kinds of monitoring functions are the kind carried out by the device used in the Hunter Nursing trial – which as has been seen requires speeds much lower than those the NBN is engineered to deliver.
- 1.125 Coalition Members are bemused by the discussion in the Committee’s Majority Report about the Hunter Nursing trial, and the failure to make reference to Dr Margelis’ answer about the speeds required.
- 1.126 Coalition Members were struck by the inability of witnesses to demonstrate a need for the speeds which the NBN is being engineered to deliver. For example, the Department of Health and Ageing was not able to give a view as to the minimum speed that is required for telemedicine. A representative of the Department was unable to even tell the Committee the speeds that would be required to provide real-time high definition video for telemedicine.<sup>85</sup>
- 1.127 In a supplementary submission, the Department sought to answer the question posed by the Committee – ‘Could you give us some of the examples of what you might see as the top end utilisation of telehealth that a specialist and GP might be looking at and what you would see as the required speeds and widths for that sort of service’.
- 1.128 In its response, the Department cited from a June 2010 report by NICTA for the Department of Broadband, Communications and the Digital Economy ‘Telemedicine in the context of the National Broadband Network’ which it quoted from as follows:
- There are very few studies addressing the minimum or maximum clinical requirements for video (although some standards exist for medical imaging). As yet, it is not determined what video specification is necessary for each clinical (or non-clinical) application. It is also not clear at what point ‘enough bandwidth’ provides sufficient fidelity.<sup>86</sup>
- 1.129 Conversely, witnesses before the committee readily agreed that there are plenty of useful telehealth applications which can be delivered at speeds

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84 Department of Innovation, Industry, Science and Research, Submission 219, p 10.

85 *Committee Hansard*, Canberra, 4 March 2011, pp.29-30.

86 Department of Health and Ageing, *Submission 212.1*, p.2.

well below those proposed for NBN. Mr Chesworth from DIISR, for example, acknowledged this point.

**Mr FLETCHER:** I presume you are not putting to us that unless there is ubiquitous, for example, 30 megabits per second there are no useful telehealth applications?

**Mr Chesworth:** That is correct.<sup>87</sup>

## Education

1.130 The Australian Council for Private Education and Training was not able to provide the Committee with data as to the speed of a connection that a student needs to have for them to be able to participate in e-learning applications.<sup>88</sup>

1.131 Representatives of Open Universities Australia were asked about a statement in their submission that ‘current demand is already at the maximum physical capability’?<sup>89</sup> Did this mean, for example, that they could not deliver two way video tutorials to students with an ADSL connection:

**Mr FLETCHER...**Are you putting to us that your technical experience has been that you cannot use ADSL over the copper for that kind of scenario?

**Mr Hamilton** – I do not know that I could be that precise.

**Ms Engwirda** – We could not be that specific.

1.132 Open Universities Australia were invited to come back to the Committee with further information to expand upon the statement in their submission and explain what they meant by it. They did not do so.

## Business

1.133 The Committee was repeatedly provided with examples of applications which it was claimed would deliver business benefits as a result of the NBN – but which in fact did not require a fibre connection.

1.134 In its submission DIISR pointed to the benefits of computerised foot scanners in retail stores.

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87 *Committee Hansard*, Canberra, 6 July 2011, p 5.

88 *Committee Hansard*, Canberra, 4 March 2011, p.44.

89 *Committee Hansard*, Melbourne, 18 March 2011, p.12.

For example, a Footwear Manufacturers' Association of Australia consortium that includes RM Williams and J. Robins and Sons has recently received Commonwealth funding to develop a mass customisation model for footwear manufacturing that will more effectively meet the needs of individual customers. Computerised foot scanners will be introduced into RM Williams' network of over 40 retail stores, with the information then relayed via the Internet to Australian production facilities to quickly and efficiently produce footwear to meet individual customer needs.<sup>90</sup>

- 1.135 DIISR acknowledged that this application was not one which helped make the case for the NBN. It did not require direct data transmission to homes, and even between the stores concerned the data transmission requirements were low.

**Mr FLETCHER:** On page 25 you talk about computerised foot scanners to be introduced into 40 retail stores. I just want to understand the argument being made here in terms of the case for the NBN. Is it proposed that this data will also be provided to households?

**Mr Lawson:** It has not been put as a case to justify the NBN. It has been put as a case for some of the uses.

**Mr FLETCHER:** Sure, but the policy question before us is the uses of the incremental bandwidth and network which is proposed.

**Mr Lawson:** In that particular case you would not expect there to be any aspect to the home.

**Mr FLETCHER:** Do we have a sense of the volume of data that is involved in a foot scanner?

**Mr Lawson:** No, that is very small.<sup>91</sup>

- 1.136 In areas where the NBN has already been built (such as Scottsdale) the evidence of business and economic benefits is scant (apart from the short term benefits of construction activity).

**Mr FLETCHER** – I want to make sure I am understanding correctly what you are saying about the economic benefits that the town has seen. You mentioned that a couple of people in the IT sector have moved into the town from other parts of Australia but, for example, there is nothing specific going on right now in terms

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90 DIISR, Submission 219 , p 25.

91 *Committee Hansard*, Canberra, 6 July 2011, p 4.

of e-medicine. Are there any other tangible economic benefits you would point to right now that the town has achieved as a result of the NBN coming?

**Mrs Mercer** – When I was talking about the economic development side of things, it was the short-term benefit to the community of having over 200 people living, eating and breathing in our community. That assisted the shop owners to keep open because we were going through an extremely tough period because tourists do not come in winter. It certainly helps our community survive.<sup>92</sup>

### Government Services

- 1.137 The Department of Finance cited a survey showing that 54% of citizens with a broadband connection say that their preferred method of contacting government is using the internet, compared to only 16% of those who do not have broadband.<sup>93</sup>
- 1.138 This is an interesting statistic which might well be persuasive evidence of the importance of increasing broadband take up; but it does not demonstrate that offering higher bandwidth will increase take up.
- 1.139 Communications Alliance pointed to the capacity to file tax returns on line, but agreed this could be done with the speeds available in the network today.

**Mr Stanton:** Certainly filing an online tax return is not a particularly bandwidth intensive exercise. If you had an ADSL-type connection you could certainly do it. The proportion would be at least those in Australia with ADSL capability. If you were an extraordinarily patient person you could probably get one through on dial-up, but that is an example where the development of the e-government application has generated benefits and does not rely on having 100 megs. It relies on concerted government action to make these things happen.<sup>94</sup>

### c. Failure to demonstrate need for FTTH speed to 10 m premises

- 1.140 A related issue is the question of why the NBN needs a direct fibre connection to some 10 million premises.

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92 *Committee Hansard*, Launceston, 10 March 2011, p 10.

93 Department of Finance and Deregulation, Submission 166, p 3.

94 *Committee Hansard*, Sydney, 29 April 2011, p 34.

- 1.141 Where the Committee was provided with examples of educational applications requiring high speed connections, these typically were connections to schools or universities or hospitals rather than connections to homes. This suggests that the policy benefit could be obtained through connecting a much smaller number of institutions (for example, the 10,000 schools in Australia) rather than 10 million homes.
- 1.142 DIISR quoted the example of a distance education application for high school science students – one which would require high speed connections to schools and hospitals, but not a high speed fibre connection to homes.

**Prof. Durant:** ..In the area of education and learning, we have been talking with one of the heart surgeons at Royal Prince Alfred Hospital about doing live heart operations for school groups through Questacon. It is based on a program called Cardiac Classroom, which is being run out the Liberty Science Centre in New Jersey. They have done over 200 live operations to secondary school groups as part of their educational and health related functions. Again, you need the high bandwidth and the latency to be able to interact with the surgeons.<sup>95</sup>

- 1.143 Similarly, AARNET offered an example of an application to a school that requires 10 Mbps.

**Mr Hancock:** ... But we still take to public schools what we call a geodome. When you were young, you had a planetarium. The geodome is 10 metres by 10 metres by four metres high. It is like a blow-up jumping castle. The kids walk inside and lie on the floor. They basically see the solar system and some packages that we get from NASA.<sup>96</sup>

- 1.144 When Dr Tim Williams in his report highlighted benefits in health in the UK, these benefits were secured because of connections to hospitals and other health sites.

**Mr FLETCHER:** ...You talk about the image exchange portal on page six of your submission. Am I right in thinking that runs between hospitals, clinics and so on?

**Dr Williams:** Yes. The cost saving is one of the issues because it used to have to be burnt onto a disk. Frankly, it is a remarkable saving, so the answer is yes to that.<sup>97</sup>

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95 *Committee Hansard*, Canberra, 6 July 2011, p 7.

96 *Committee Hansard*, Sydney, 29 April 2011, p 13.

97 *Committee Hansard*, Sydney, 29 April 2011, p 15.

- 1.145 Similarly, his examples concerning education related to the benefits of connecting schools to the network.

**Mr FLETCHER:** You have talked about the benefits of broadband in education and again I presume that is based upon connections to schools.

**Dr Williams:** Yes.<sup>98</sup>

- 1.146 DIISR pointed to an application called Labshare as an example of what the NBN would facilitate.

An example of the way the NBN can be leveraged in the ways noted above is through Labshare, a program run through the University of Technology Sydney (UTS) that provides students in upper secondary and at the tertiary level with access to a number of remote control experimental apparatus including structural visualisation and loaded beams.<sup>99</sup>

- 1.147 Labshare's website indicates that its operational model is to share laboratories over the internet between institutions – not to homes.

The Labshare Institute is a not-for-profit organisation established to provide service to a national network of shared remote laboratories.<sup>100</sup>

- 1.148 As part of its field activities and inspections in conjunction with its inquiry, the Committee was hosted by the University of Melbourne and its associated Institute for a Broadband-Enabled Society (IBES). Members were impressed by the scope and potential of a range of demonstrations in the areas of education and medicine.

- 1.149 In its submission to the Committee, the University of Melbourne outlined the potential uses of broadband applications in education and medicine in the higher education sector – including tele-presence applications and virtual collaboration spaces. The University spoke of:

Fully immersive 3D virtual reality learning environments with haptic (force feedback) capabilities that allow practice and rehearsal of complex procedures. For example, researchers at the MUVRS laboratory at The University of Melbourne have developed haptic-enabled immersive environments that can be

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98 *Committee Hansard*, Sydney, 29 April 2011, p 16.

99 Department of Innovation, Industry, Science and Research, Submission 219, p 14.

100 <http://www.labshare.edu.au/corporate/institute>, accessed 15/8/11.

used to train surgeons so they can experience giving an operation prior to practicing on real patients.<sup>101</sup>

- 1.150 The Committee witnessed demonstrations of a range of ‘over the horizon’ applications including robotic and remote surgical applications, remote dentistry, a remote rehabilitation device, aged care monitoring and advanced tele-conferencing applications.
- 1.151 Against the background of the University’s broadband vision and its demonstrated applications, Coalition Members endorse the view that high-speed broadband, regardless of which mode is applied, has a clear application to education and tele-medicine.
- 1.152 Coalition Members authors express the concern that the demonstrated applications (and doubtless others from similar broadband-enabling research groups) are not yet at the stage of being practical on-the-ground applications. It is of little value unless the research is applied universally and early as high speed broadband is rolled out. While fibre optic connections may be the ideal, and while a number of provincial educational organisations and hospitals may already have fibre access, the object should be a ubiquitous service which includes hospitals in country towns, cottage hospitals and bush-nursing centres.
- 1.153 The Committee noted, in response to a question to IBES personnel, that the demonstrations witnessed by the Committee, utilised a maximum speed 20Mbps. Coalition Members note that if even such ‘over the horizon’ applications do not use anything like the 100 Mbps which the NBN is engineered to deliver, it further underlines the point that there was a failure to demonstrate the applications which require such speed and which will drive take up to millions of homes.
- 1.154 If a rollout of fibre and wireless to hospitals and other health institutions is occurring, it is unlikely to deliver the expected benefits unless Commonwealth and State Governments ensure a training strategy is put in place so that medical staff are up-skilled to utilise and handle new high speed technologies. Coalition Members would recommend such training programs be instituted by Commonwealth and State Governments, as any such rollout occurs, in regional, rural and remote hospitals and nursing centres, and that they address the delivery of interactive medical, dental, aged care and rehabilitative services.

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101 University of Melbourne, Submission 120, p 5.

#### d. Witnesses called for higher speeds – but few showed a need for fibre

1.155 Many witnesses before the Committee spoke of their particular projects and activities, and how they believed improved broadband could assist them. In many cases, though, witnesses conceded that they did not have an understanding of exactly what speeds they required, or the technology needed to deliver such speeds.

1.156 Witnesses from the Inspire Foundation, which works to combat depression in young people, after talking about their desire to offer two way video chat, acknowledged that they were not putting a specific view about speed or technology.

**Mr NEVILLE:** ... Do you know what speed you will need for that?

**Mr Hosie:** I do not have that knowledge.

**Mr NEVILLE:** Have your technical people said that to you?

**Ms Stace:** No, not specifically. But we look at the broadband and the speeds the broadband is promising and they seem well within the range of being able to offer that type of service.<sup>102</sup>

1.157 Ms Little from the Australian Library and Information Association spoke about internet access at Gunghalin library using 'sound domes' to allow people for example to use Skype, but declined to cite a specific speed or technology:

**Ms Little:** ... We have set up in the new Gungahlin library really funky-looking sound domes that are connected to the internet...

**Mr NEVILLE:** What sort of speed do you need for that?

**Ms Little:** Now you are asking a technical question. I might pass over to –

**Mr NEVILLE:** I am not trying to be tricky with this question. We are talking about people having services now of about three, four, five or six and we are talking about wireless going up to 12 and perhaps in time to 20. But what sorts of speeds do libraries need?

**CHAIR:** Do you want to take that on notice and come back to us?

**Ms Little:** Yes.<sup>103</sup>

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102 *Committee Hansard*, Canberra, 27 May 2011, p 13.

103 *Committee Hansard*, Canberra, 27 May 2011, p 19.



- 1.158 Tasmanian Farmers similarly wanted more speed – but did not specify exactly what speed or technology they sought.

**Mr FLETCHER**...You are not, however, putting to us a specific view on precisely what speed is required or precisely what technology is required – I think that is right, isn't it? – just that it should improve.

**Ms King** – Something that is adequate, as you can understand, if you are going to start downloading pictures.<sup>104</sup>

- 1.159 The Australian Medical Association indicated that they wanted faster speeds more widely available – but were not making a specific call for any particular speed or technology.

**Mr FLETCHER** – Again, I just want to understand if I am capturing properly what you are putting to us. Is it a fair summary of your position that you are not putting to us a particular view about fibre versus copper versus satellite; you are really saying that what you are interested in is: (1) having sufficient speed to deliver the services or practice the way you want to and benefit patients the way you want to; and (2) trying to level things up so that those who are conspicuously behind, in terms of the speeds they get, are not so far behind?

**Dr Hambleton** – Once again, I think that is a fair summary. We would like to see a big pipe. We do not care how it gets there, as long as it is big and it has lots of water in it.<sup>105</sup>

- 1.160 The National Rural Health Alliance, who appeared before the Committee on 4 March 2011, were asked about the specific speeds they felt were necessary, and undertook to make further investigations on this point. Their supplementary submission reported on their investigations as follows.

Dr Jenny May's inquiries indicate that most of the Hunter New England Health (HNEH) network (which includes the Tamworth hospital she referred to in her evidence) is connected by fibre, on speeds of 10 MB/s to 1 GB/s. There are still some existing copper and ADSL connections in the network running from 4 MB/s to 10 MB/s.

However, the main interest in the NBN in such rural settings is in improving traffic when it leaves the regional health network, for

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104 *Committee Hansard*, Launceston, 10 March 2011, p 47.

105 *Committee Hansard*, Canberra, 4 March 2011, p 21.

example when a GP wants to access images from the hospital in his or her rooms, or when someone in the health network connects to an external videoconferencing unit to contribute to a case conference.

At present a rural clinic may have 128 kb/s or 512 kb/s asymmetrical connections, but an upgrade to 4 MB/s would enable the local Nurse Practitioner and a visiting GP to work on-site, entering patient notes and working from their clinic records.<sup>106</sup>

- 1.161 The submission also noted that videoconferencing would require speeds of between 8 and 20 Mbps. It is noteworthy that the speeds cited in both the previous paragraph and this paragraph are well short of the speed which the NBN is designed to deliver over fibre.

#### e. Witnesses generally prioritised ubiquity over speed

- 1.162 Witness after witness, from sector after sector, made the point that a key benefit was ubiquity – that is, that a given broadband speed is ubiquitously available to households and businesses – and this was more important than the particular speed.
- 1.163 A good example is the perspective of the Australian Telecommunications Users Group, an organisation with long experience in contributing to public policy on telecommunications and broadband in Australia.

**Mr FLETCHER:** On that important point, is it an implication of that that ubiquity of service or connectivity is one dimension and speed is another and distinct dimension?

**Ms Sinclair:** Yes, it is. If you look through all of our papers we place heavy emphasis on ubiquity.<sup>107</sup>

- 1.164 Dr Jennifer May, Chair of the National Rural Health Alliance advised the Committee:

Delivery of health information I doubt is particularly speed dependant but I think it is key, and that is that universality concept.<sup>108</sup>

- 1.165 This sentiment was echoed by Ms Sally Anne Thompson, CEO of Adult Learning Australia:

106 National Rural Health Alliance, Submission 143.2, p 1.

107 *Committee Hansard*, Sydney, 29 April 2011, p.41

108 *Committee Hansard*, Canberra, 4 March 2011, p.9.

**Ms Thompson**—I must admit that when it starts to get into the details of the speed it is beyond my expertise. I guess, as a general principle, I would say we are much more interested in the ubiquitousness than we are in the speed. If you had to choose between speed and ubiquitousness, we would always go with a lesser speed and broader coverage. So what excites us the most about the project is the ubiquitousness of it.<sup>109</sup>

- 1.166 A similar view was expressed by Dr Jill Abell, Director of IT, The Hutchins School:

**Mr FLETCHER**—Is it also a fair summary of what you have been saying that as you think about your strategy for e-learning and serving students, the issue of greatest interest to you about the connection they will have at home is knowing that there is a uniform connection? In other words, you know that every student is going to have a particular connection and you can make that assumption as you do your planning. Is that a fair statement?

**Dr Abell**—Yes, that is.<sup>110</sup>

- 1.167 Dr Terry Percival of NICTA also drew attention to the distinction between speed and ubiquity.

**Mr FLETCHER:** ... You underlined ubiquity. Can we take from that that you see benefits in ubiquity regardless of where the speed point happens to be set at?

**Dr Percival:** Once the speed point is set above a certain level, yes. Examples include education.<sup>111</sup>

- 1.168 Dr Percival went on to indicate that a speed of 10 Mbps was what he had in mind as the 'certain level.'<sup>112</sup> This is a speed that many Australian premises receive today, and not one which requires fibre to the premises.

- 1.169 Mr Robert Walker, Chief Executive Officer, Agforce Queensland, put a similar view:

**Mr FLETCHER**— ... I right in thinking that some of the agricultural applications, like soil moisture monitoring and so on, do not so much require super-high bandwidth as they require the wider availability of a uniform bandwidth so that you can then,

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109 *Committee Hansard*, Canberra, 4 March 2011, p.52.

110 *Committee Hansard*, Hobart, 11 March 2011, p.47.

111 *Committee Hansard*, Sydney, 29 April 2011, p.57.

112 *Committee Hansard*, Sydney, 29 April 2011, p.57.

for example, deploy sensors in the knowledge that there will be a network for them to connect to?

**Mr Walker** – Yes, that is correct, whether it be soil moisture, whether it be remote monitoring of bores. Your point is correct. It is not about speed; it is about availability and general application.<sup>113</sup>

- 1.170 Mr John McGee, Chief Executive Officer, Tasmanian Electronic Commerce Centre also emphasised ubiquity.

**Mr FLETCHER**... I think what you are saying is that it is not a particular speed but it is ubiquity and the fact that every household has ubiquitously available a certain speed and therefore people developing applications, for example, can know that that is there. Is that a fair summary?

**Mr McGee** That is a true comment and that is the experience we have had in the ICT sector...<sup>114</sup>

- 1.171 Witnesses from the government sector also emphasised the importance of ubiquity rather than speed. Mr Andrew Mills, Chair, NBN Taskforce, South Australian Government commented:

**Mr Mills** - I think ubiquity is not talked about enough. It is not about getting broadband to people; it is about everybody having it.<sup>115</sup>

- 1.172 A submission from IT company SAIC spoke of the use of broadband networks to deliver government services, but noted that the applications do not need the kind of speed that NBN will provide. What is valuable is the ubiquitous availability of connections.

The majority of currently available systems do not need bandwidth capacity being constructed by the NBN; however, they all rely on universal access to modern network speeds...<sup>116</sup>

- 1.173 If ubiquity is the key benefit, this could be achieved at much less expense by achieving the ubiquitous provision of a speed that does not require fibre to the home. A number of witnesses made this point, including Mr Stanton of the Communications Alliance.

113 *Committee Hansard*, Brisbane , 18 March 2011, p.43.

114 *Committee Hansard*, Hobart, 11 March 2011, p.72.

115 *Committee Hansard*, Adelaide, 4 April 2011, p.61

116 SAIC, Submission 35, p 3.

**Mr FLETCHER:** I was also interested in your comments on page 5 about ubiquity and drawing a distinction between ubiquity, on the one hand, and bandwidth or speed on the other. That makes a lot of sense to me. Is there an implication that you could set a policy target to achieve ubiquity which is quite independent of the speed target that you choose?

**Mr Stanton:** Certainly. You could, as a government, choose to say, as the Japanese have, that we will ensure that 100 per cent of the country has at least 30 megs or higher, recognising they had some previous investments. All of their new rollout is 100 meg, but they have said, 'The line in the sand for our country is 30 megs or higher.' Yes, they have pushed for ubiquity. They have used a very high speed network for the last piece of it, but they have decided that 30 megs is a functional number for those who do not yet have fibre to the home.

## 7. Better ways forward

- 1.174 Much of the evidence provided to the Committee suggested that there may be better (and certainly more cost-effective) ways to proceed than rolling out a fibre network to 93 per cent of premises.
- 1.175 For example a strategy of quickly connecting homes which are presently in broadband black spots may make more sense. It also may make good sense to concentrate on connecting key classes of institutions: schools, hospitals, libraries and so on.

### a. Targeting rapid improvements to black spots

- 1.176 The NBN will not be completely rolled out until FY2021 (if it meets its rollout schedule; it will very likely run behind schedule given that it has missed key milestones to date.) This means a wait of a decade or potentially more for those many Australians have inadequate services today. For example, due to the widespread use of pair gain systems in Telstra's network ADSL is often not available.
- 1.177 A submission received by the Committee offers a good example of this problem – a graphic design business operating in a new subdivision where ADSL2+ is not available.

I make the following submission as a small business owner needing fast and reliable broadband. I recently relocated from an

area where ADSL2 was available to a new subdivision where, at first, dialup was the only available connection. The pair-gain cabling which has been laid here does not support ADSL.<sup>117</sup>

- 1.178 The NBN strategy is essentially ‘Super fast broadband arriving super slowly.’ As this submission highlights, the interests of many Australians may be better served by a ‘Get broadband fast’ strategy of delivering ADSL2+ quickly to existing black spots, than by the NBN.

## b. Targeting higher speeds to key institutions

- 1.179 Considerable evidence was received suggesting that many of the claimed benefits could be achieved if expenditure were concentrated on connecting key institutions such as schools, hospitals and libraries to fibre.

- 1.180 For example, Dr Jill Abell, Director of IT at The Hutchins School in Tasmania, informed the Committee of her school’s use of IT in educating students. This did not depend on improved connectivity to students’ homes.

**Mr FLETCHER** – I am interested in the strategy of connecting schools, as opposed to the strategy of connecting homes. I think what I am hearing from you – correct me if I have it wrong – is that for your school the important thing was getting the very high speed connection to the school. The existing infrastructure that connects homes, where students and parents are, has been adequate because what you have been focused on has been the school connection. Is that a fair summary?

**Dr Abell** – Yes, it is. The end-to-end performance between the school and the other organisations – other cultural research institutions around the nation and the world – facilitates the connectivity for the home.<sup>118</sup>

- 1.181 If the government’s strategy were to deliver high speed connections to key institutions, libraries would be an obvious inclusion. Evidence from the Australian Library and Information Association highlighted the role of libraries in providing access to many people who cannot otherwise get broadband services.

**Ms Little:** ...Where we are seeing a really important role – and I guess I declare an interest in that I have Gungahlin library in my portfolio and that is an NBN area – is in providing that access to

117 Art When You Need It, Submission 37, p 1.

118 *Committee Hansard*, Hobart, 11 March 2011, p.47.

services much better. So, if the NBN is brought into my library at Gungahlin, the people who cannot afford to have the broadband to their home at the moment or who do not understand it and are quite nervous about it can come into my library and receive and access and training on how to use it.<sup>119</sup>

- 1.182 Witnesses from the ALIA were clear in calling for libraries to be connected as a priority.

**Mr FLETCHER:** Is it fair to say that you argue that to maximise the effectiveness and accessibility of a broadband policy strategy it makes sense to focus on particular types of institutions to connect to as a priority, and that libraries would be one of those types of institutions?

**Ms Hutley:** Very much so.<sup>120</sup>

- 1.183 Another obvious class of institution would be hospitals. NSW Health pointed out the priority of connecting all hospitals in NSW to a secure broadband network. Its submission cited '...Recommendation 51 of the Garling Report, for the establishment of 'a high speed broadband network....securely linking all public hospitals in NSW so as to enable the provision of specialist clinical services and support via the network from metropolitan based clinicians and hospitals to regional, rural and remote clinicians and hospitals'.<sup>121</sup>

- 1.184 When asked about the institutions he would prioritise if funding were limited, Dr Terry Percival of NICTA spoke of schools, TAFEs and government departments.<sup>122</sup>

- 1.185 A strategy of prioritising key classes of institution would clearly be much cheaper than the NBN. For example, AARNET gave evidence about the incremental cost of extending its network to a range of other institutions; the figures were much lower than the expenditure exceeding \$50 billion so far announced for the NBN.

**Mr Hancock:** ...we have already proposed to the federal government and AEDN – an Australian Education Digital Network – which is what we call an overlay network. We simply build a network over the top of our network and provide a backbone for the school system. We also proposed the original

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119 *Committee Hansard*, Canberra, 27 May 2011, p 19.

120 *Committee Hansard*, Canberra, 27 May 2011, p 22.

121 NSW Health, Submission 117, p 2.

122 *Committee Hansard*, Sydney, 29 April 2011, p 61.

VEN, which is the vocational education network – the \$80 million network; you might have heard about that – for connecting the major TAFE institutes around the country.<sup>123</sup>

### c. Maintaining greater flexibility in the network build

1.186 Smartnet argued that the insistence on the 93 per cent fibre target means we will not be able to take advantage of improvements in wireless technology.

We also have some concerns about the emphasis that has been placed on fibre to the premises, or at least to 93% of them. This is an arbitrary figure and in all probability technology and the need for ‘internet on the go’ will result in wireless services playing a significant role in how we access the internet of the future. This is already becoming evident overseas. For the moment, we would caution against a fixed objective to connect 93% of premises with fibre...

In this regard, we think that the priority for connecting fibre to virtually all premises has been somewhat oversold and the potential of wireless has been undersold...Wireless technology is changing rapidly and we are likely to see that over the next five years wireless technology, data compression and networking innovations produce performance approaching the 100Mbs a second presently promised by NBN Co.<sup>124</sup>

## 8. Some nasty side effects

1.187 Coalition Members note the extensive evidence provided to the Committee about some nasty side effects of the NBN. NBN Co will have monopoly power and its management team will determine key broadband policy settings.

### a. NBN Co monopoly means higher prices and less competition and choice

1.188 Mr Maha Krishnapillai of Optus highlighted that company’s concerns that NBN will be a monopoly.

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123 *Committee Hansard*, Canberra, 27 May 2011, p 28.

124 Smartnet, Submission 134, p 7.



We still remain concerned that we have created, effectively, a monopoly, and we want to make sure that wherever possible there are as many checks and balances and as much transparency in the ongoing operation of the NBN as possible. A couple of examples would be: we would like to see greater transparency between NBN Co.'s deal with Telstra; we would like to see greater competitive dynamic exerted on NBN Co. in years to come...<sup>125</sup>

- 1.189 Mr Mark Needham, a member of the Regional Telecommunications Independent Review Committee, expressed concern that the NBN was likely to stifle competition in rural and remote areas (the 'last seven per cent.')

**Mr Needham** – The committee certainly had a very strong preference for competitive supply. Competition assists greatly in delivering a worthwhile outcome. In the seven per cent that certainly will be stifled. If the USO provider provides a better quality, lower cost service on their own back than the NBN service, is the provision of the NBN service in those locations a waste of money, in that it has not been engineered to deliver the outcomes that are necessary at an appropriate price using the appropriate technology? That dilemma looks like it will exist relatively soon and I do not know the answer to that. To me stifling of competition in relation to the seven per cent is a problem.<sup>126</sup>

- 1.190 Mr David Jackson, Manager Economic Development, Brisbane City Council, highlighted concerns that the NBN structure is likely to produce higher costs than the structure the Council was considering for its broadband network.

**Mr Jackson** - Council is concerned that a key feature of the business model that we were visualising is not provided for in the architecture of the NBN. The architecture of the NBN does not allow the full benefits and functionality of the technology to be realised. The architecture builds in costs that make the use of it more expensive than it needs to be, limiting the scope to bring down costs, maximise utilisation and make Queensland and Australia more competitive.<sup>127</sup>

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125 *Committee Hansard*, Sydney, 29 April 2011, p 23.

126 *Committee Hansard*, Brisbane, 18 March 2011, pp21-22.

127 *Committee Hansard*, Brisbane, 18 March 2011, pp4-5.

- 1.191 Mr James Kelaher of Smartnet commented that the focus on fibre to 93 per cent (the political objective set for the project) is distorting choices and producing sub-optimal outcomes. This will mean higher prices, less competition and take up being held back.

**Mr Kelaher** ...If you are running a project that is focusing on fibre to 93 per cent of homes and you are trying to generate returns and attract debt to do that, then you need to ensure that the revenue flows generated by that project are attractive to debt financiers. That means that you need to set your pricing parameters at such a rate that will attract debt financiers. You also need to ensure that there are no cherry pickers that will undermine that price, which takes you down a route of stipulating a base price, which we already think is too high and which will in the long term be a barrier to adoption by a large number of the population.<sup>128</sup>

- 1.192 Mr Kelaher commented that a better approach would be to focus on getting services quickly to areas that are underserved.

**Mr Kelaher** ...We would like to see more focus on how to get runs on the road as quickly as possible for those areas that historically have been underserved by broadband and how to ensure that we are stimulating and responding to the developments that are occurring internationally around mobile devices.<sup>129</sup>

- 1.193 Internet service provider Internode provided evidence that NBN's pricing is sharply higher than pricing in the marketplace today.

When we look at point to point uncontended services the wholesale cost of a point to point 100 megabit link is over \$9,000 per month. This is a disappointing number because it's the same cost as a gigabit service today from existing wholesale providers.

Under the current Product and Pricing construct the NBN will be ten times as expensive as existing wholesalers are today for corporate and business grade services.<sup>130</sup>

- 1.194 Internode also makes the point that movie download services like Netflix will be unviable under NBN Co's pricing construct.

The Netflix service would not be economically viable under the NBN Co Product and Pricing construct because the \$20 per megabit cost of the concentrating virtual circuits (CVCs) means

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128 *Committee Hansard*, Brisbane , 18 March 2011, p.59.

129 *Committee Hansard*, Brisbane , 18 March 2011, p.59.

130 Internode, Submission 224, p 3.

that subscribers who use a Video on Demand service will cost their retailer at least \$66 per month.<sup>131</sup>

- 1.195 Dr Marcus Bowles provided evidence that the cost of data in Australia is high by world standards, and the initial pricing offered on the NBN suggests this will continue to be the case in the NBN world.

Currently Australia's cost of data per MBit/s is higher than the OECD average and all countries with comparably high broadband penetration rates. At USD\$11.82 Australia was ranked 15th in a comparative study of average price per advertised Mbit/s (OECD, Broadband Statistics as at October 2009), far higher than the lowest price of USD\$1.76 (Korea) and, with the exception of Sweden, way behind all the countries ranked in the top ten BQS nations that had averages below USD\$5.56 per Mbit/s (Vicente et al. 2009: 9; BQS 2010). Rather than directly addressing this issue there is currently evidence that suggests the initial cost of data per MBit/s for those offered subscriptions that connect to the NBN are not at all competitive with OECD price averages (Bowles, 2011).<sup>132</sup>

- 1.196 As Broadband Minister Conroy recently said acknowledged, the latest OECD statistics show that Australians pay relatively high prices for the Internet compared to other countries, particularly for 'low speed' connections where Australian prices are the third most expensive of 24 countries.<sup>133</sup> This raises a critical question: what impact will the NBN have on broadband pricing for end users?
- 1.197 Coalition Members are concerned that because the NBN uses such an expensive network design (fibre to the home), prices on the network will inevitably need to stay high to allow NBN Co to meet its financial return targets. We also fear that the NBN will reverse a long-term trend of falling prices: according to the OECD, DSL pricing in Australia fell by 69% between 2005 and 2010.<sup>134</sup>
- 1.198 We are particularly concerned about the likely impact on regional and low income households, which already have relatively low broadband usage. Broadband take up is lower in regional households (at 62%) than metropolitan ones (75%). 94% of high income households (earning more

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131 Internode, Submission 224, p 3.

132 Dr Marcus Bowles, Submission 42, p 5.

133 [http://www.minister.dbcde.gov.au/media/media\\_releases/2011/157](http://www.minister.dbcde.gov.au/media/media_releases/2011/157), accessed 19/8/11.

134 OECD (2011) - OECD Communications Outlook 2011, OECD Publishing, Table 7.17 page 293, showing Telstra BigPond pricing.

than \$120,000 a year) have access to the internet at home compared to only 43% of households earning less than \$40,000.<sup>135</sup>

- 1.199 We heard no evidence explaining how the NBN is going to change this inequitable distribution by making broadband more affordable. Some witnesses expressed their hopes for increased broadband access by disadvantaged groups. However witnesses including from government were unable to explain how the NBN will deliver cheap connectivity and drive down prices.
- 1.200 Many witnesses expressed concerns that high prices for services on the NBN will impede demand and take up.
- 1.201 Ms Rosemary Sinclair of ATUG pointed to the importance of retail pricing in influencing take up, and in turn the importance of a competitive market in delivering attractive retail pricing.

What we have got in the market at the moment of course is relatively affordable wholesale prices. The question is: what will the retailers do? I think it is really a watch-this-space issue. If the market is truly competitive then the retail prices will be competitive and affordable. But if the market is not as competitive as we would like to hope then perhaps we will have a problem with those retail prices.<sup>136</sup>

- 1.202 Mr Andrew Mills, Chair, NBN Taskforce, South Australian Government, highlighted the risk for disadvantaged consumers.

**Mr Mills** – There are always risks. The people who are most disadvantaged will get the most out of the NBN. The challenge is that they will probably be the ones who can least afford it. So I think there is a challenge there. Getting that price to suit everyone's ability is really important.<sup>137</sup>

- 1.203 Mr David Jackson of Brisbane City Council commented that the structure of the NBN was likely to produce unnecessarily high prices.

**Mr Jackson** – What I am saying is that there is a number of levels in the NBN system whereby additional parties come into it and put their charges on to the cost to the end user that may not need

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135 ABS Catalogue No. 8146.0 (2010), Household Use of Information Technology, Australia, 2008-09, page 9.

136 *Committee Hansard*, Sydney, 29 April 2011, p 41.

137 *Committee Hansard*, Adelaide, 4 April 2011, p.61.

to be there, and inevitably you will have an increased cost. That would be my concern.<sup>138</sup>

- 1.204 The evidence from communities which have the NBN suggests that the cheap pricing offered under the trial arrangements was a factor in persuading people to sign up to the NBN.

**Mrs Farnell** – At home I am on the basic 15-gig plan and the speed is so much faster than my current ADSL at work and it is \$10 a month cheaper.<sup>139</sup>

- 1.205 Mrs Farnell said that she pays \$29.95 a month for NBN at home, compared to \$39.95 for an ADSL service from Telstra at work.<sup>140</sup>

- 1.206 Since that time internet service providers have begun to announce their retail prices. It is clear that these will be much higher than the trial prices. Internode's entry level price will be \$59.95 for a 12 megabit per second service with a 30 gig download.<sup>141</sup> In other words, attractive pricing will not be a factor causing people to move across to NBN from their existing services.

- 1.207 Mr Andrew Connor from Digital Tasmania talked about his expectations for retail prices on the NBN when he appeared before the Committee.

To see a 100-megabit service at, say, \$50-\$60 a month is still a bargain, and to take away the fixed line rental that you are paying of \$20-\$30 a month for a service that many people do not use – they have it just so they can get an ADSL service – is clearly a saving in the long run.<sup>142</sup>

- 1.208 The recently released retail pricing suggests that Mr Connor will be disappointed, with the lowest priced 100 Mbps service offered by Internode priced at \$99.95.<sup>143</sup>

## b. NBN Co's management setting agenda

- 1.209 Ms Rosemary Sinclair of ATUG highlighted the risk that NBN management's priorities will end up distorting the achievement of telecommunications and broadband policy objectives.

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138 *Committee Hansard*, Brisbane, 18 March 2011, pp8.

139 *Committee Hansard*, Launceston, 10 March 2011, p 11.

140 *Committee Hansard*, Launceston, 10 March 2011, p 14.

141 ADD REFERENCE – INTERNODE WEBSITE.

142 *Committee Hansard*, Launceston, 10 March 2011, p 25.

143 <http://www.internode.on.net/news/2011/07/236.php>, accessed 15/8/11.

**Ms Sinclair:** Yes, I think there is a risk because it is human to want to make the biggest and best mousetrap and return that you can...I think that the ongoing management of NBN Co. to ensure that the policy objectives are achieved is going to be a very important task.<sup>144</sup>

- 1.210 Mr James Kelaher, Director Smartnet, highlighted the risks to the backhaul market (and in turn the mobile operators and their customers) from the likely pursuit by NBN Co management of their own agenda.

**Mr Kelaher...**Most of the telcos that are talking 4G and LTE are probably anticipating using the backhaul network that NBN Co.is putting in place. I think that does –

**Mr FLETCHER** – In a sense that leaves them, does it not, exposed to the particular approach that the NBN management chooses to take on that as opposed to an alternative model that might be conceived in which there was a stand-alone entity that only owned backhaul and did not own an access network?

**Mr Kelaher** – I think that is right.<sup>145</sup>

## 9. Conclusion

- 1.211 This inquiry was set up for political reasons by the Gillard Labor Government. The objective was to generate a feel-good report offering support for the rollout of the NBN.
- 1.212 Despite that, some useful information has emerged. We have seen some impressive examples of the ways in which broadband can deliver benefits in health, education, government, business and other sectors. Coalition Members congratulate the many innovative Australian companies and organisations using and developing broadband technology.
- 1.213 Most importantly, the inquiry has highlighted the gaping flaws in the NBN policy. It is clear that the NBN has been poorly planned and implemented, following its highly political conception in April 2009 (after the failure of Labor's previous broadband policy.) It is also clear that many of the key claims which have been made about the NBN by the Rudd-Gillard government are overblown and cannot be substantiated.

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144 *Committee Hansard*, Sydney, 29 April 2011, pp 41-42.

145 *Committee Hansard*, Brisbane , 18 March 2011, pp.68-69.

- 1.214 The inquiry demonstrated that the central premise of the NBN policy – that there is overwhelming demand for fibre to the home – is wrong.
- 1.215 The single most striking conclusion from this inquiry is that there were very few persuasive examples given of applications which actually require the speeds that the NBN will deliver. There was a similar failure to demonstrate the need for this speed to 10 million premises – as opposed to a rollout targeted to a much smaller number of key institutions such as schools, hospitals and libraries.
- 1.216 The evidence also highlighted some very nasty side effects of the Rudd-Gillard Government’s NBN policy. In particular, by establishing a government owned monopoly, the government is suppressing competition and handing enormous power to NBN Co’s management team. The likely consequence – prices will be higher and take up lower than under a competitive market structure.
- 1.217 This inquiry has only deepened our conviction that Labor’s NBN is a serious misstep as Australia navigates towards the required outcome of an improved broadband infrastructure operating within a competitive market.

Mr Paul Neville MP

Deputy Chair

Mr Paul Fletcher MP

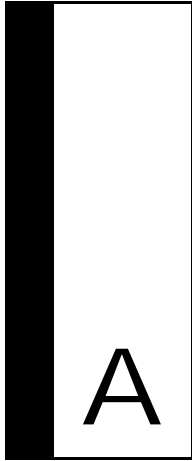
Member

Mrs Jane Prentice MP

Member







## Appendix A – Background

### Current broadband services in Australia

1. The term 'broadband' can be loosely defined as a service that delivers data transfer speeds faster than those achievable using the 'narrowband' dial-up internet services that were ubiquitous in the 1990s. The actual speed of a broadband service may therefore vary greatly. The Australian Bureau of Statistics (ABS) defines broadband as 'an "always on" internet connection with an access speed equal to or greater than 256 kbit/s'.<sup>1</sup> This compares to 56 kbit/s for most dial-up connections. 'Always on' means that the service can remain constantly connected to the internet without disrupting voice telephone services.
2. The OECD also defines broadband as internet connectivity capable of download speeds of at least 256 kbit/s,<sup>2</sup> while the US Federal Communications Commission recently updated its definition of broadband to refer to speeds of at least 4 Mbit/s download and 1 Mbit/s upload speeds.<sup>3</sup>

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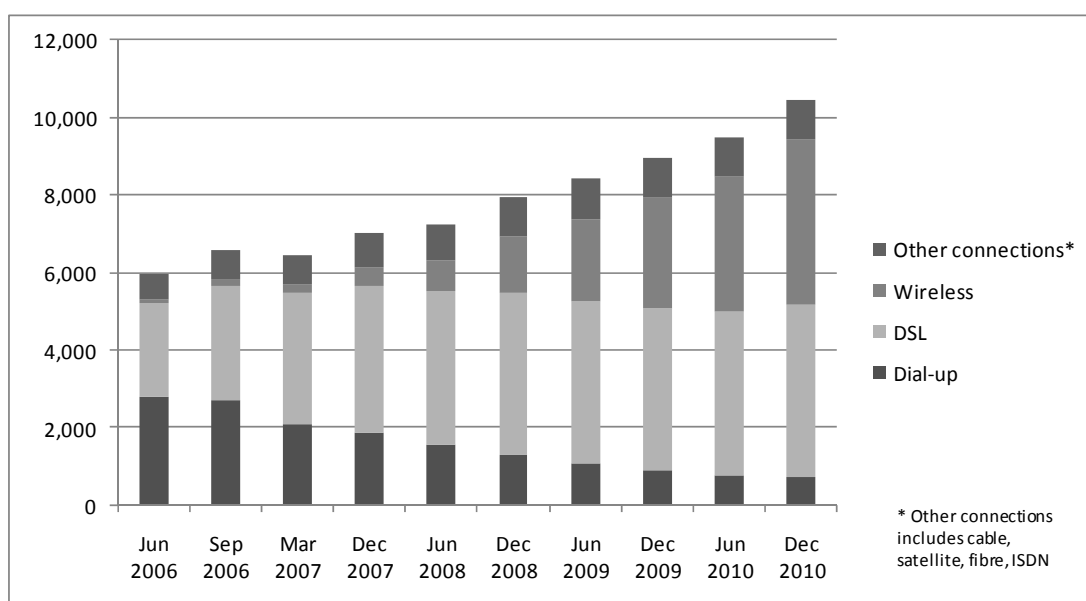
1 Australian Bureau of Statistics (ABS), 'Information and Communication Technology (ICT) and Innovation Statistics Glossary' <<http://www.abs.gov.au/websitedbs/c311215.nsf/20564c23f3183fdaca25672100813ef1/c49fb25ed58f2ec4ca25702f001eeaaa!OpenDocument>> viewed 28 January 2011.

2 OECD Broadband Subscriber Criteria, 2010 <[http://www.oecd.org/document/46/0,3746,en\\_2649\\_34225\\_39575598\\_1\\_1\\_1\\_1,00.html](http://www.oecd.org/document/46/0,3746,en_2649_34225_39575598_1_1_1_1,00.html)> viewed 28 January 2011.

3 FCC, *Sixth Broadband Deployment Report*, 16 July 2010 <[http://hraunfoss.fcc.gov/edocs\\_public/attachmatch/FCC-10-129A1\\_Rcd.pdf](http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-10-129A1_Rcd.pdf)> viewed 28 January 2011.

3. Advertised speeds for all types of broadband services are usually an indication of *peak* speed, which is the theoretical maximum speed allowed by the technology. However, the actual speed of data transfer experienced by users will vary greatly depending on a number of other factors, including their distance from the nearest exchange or transmission tower (particularly for DSL and wireless broadband), the number of other users on the network at the particular time (particularly for wireless, satellite and cable), and physical barriers and weather conditions (particularly for wireless and satellite). The average speed that is experienced by users is usually significantly lower than the peak speed.<sup>4</sup>
4. According to the ABS, 43 per cent of Australian internet access connections in December 2010 were DSL broadband, closely followed by mobile wireless broadband at around 40 per cent. Dial-up internet connections now make up less than 7 per cent of connections, a decrease from 47 per cent in June 2006. The remainder of connections are made up of cable, satellite, fixed wireless and a small number of fibre connections and other technologies, as shown in the below figure.<sup>5</sup>

Figure A.1 Number of internet subscribers by connection type, all ISPs, 2006-2010



Source Australian Bureau of Statistics, 8153.0 – Internet Activity, Australia, Dec 2010

4 McKinsey-KPMG, *National Broadband Network Implementation Study*, 2010, p. 275.

5 ABS, 'Table 1 Internet subscribers by type of access connection, for ISPs with more than 1,000 active subscribers', 8153.0 – Internet Activity Australia, December 2010. <<http://www.abs.gov.au/AUSSTATS/abs@.nsf/Lookup/8153.0Main+Features1Dec%202010?OpenDocument>> viewed 18 July 2011.

## DSL broadband

5. Currently, most fixed line broadband services in Australia are Digital Subscriber Line (DSL) connections. DSL uses existing copper-based telephone networks to digitally transfer data.<sup>6</sup> Asymmetric DSL (ADSL) is the most common type, and simply indicates that data is uploaded at a lower rate to that at which it is downloaded. ADSL 2 and 2+ are common variations of this technology which enable faster download speeds than more basic ADSL 1 standard, provided premises are close enough to a telephone exchange. Other variations include VDSL (Very High Bitrate DSL), which can provide even faster transfer speeds close to an exchange.<sup>7</sup>
6. Unlike dial-up internet, DSL data is transferred at different frequencies to voice data, enabling users to be connected to the internet at all times without affecting their telephone services.<sup>8</sup>
7. The use of existing copper networks makes DSL services theoretically available to all premises with a telephone line; however, there are several limitations which mean ubiquitous DSL broadband is not currently possible. Firstly, local telephone exchanges must have equipment known as DSL Access Multiplexers (DSLAMs) installed by an internet service provider (ISP) before DSL services can be offered.<sup>9</sup> While ADSL 2+ is now available at most metropolitan and larger regional exchanges, the limited commercial appeal of more remote exchanges mean that it is still not available in many areas. According to the NBN Implementation Study, DSL broadband of some type is available to approximately 92 per cent of the population.<sup>10</sup>
8. Secondly, a lack of competitive fibre 'backhaul' networks in many parts of Australia means that high quality and affordable DSL services are not possible without significant new investment in infrastructure, which the private sector has been reluctant to undertake given limited potential for return.<sup>11</sup> The government's Regional Backbone Blackspot Program (RBBP) is going some way to addressing this problem (see further details below).

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6 Alcatel-Lucent, *The National Broadband Network: a glossary of terms*, 2010.

7 Ayre et al, 'A Guide to Broadband Technologies', *The Australian Economic Review*, vol. 43, no. 2, June 2010, p. 201.

8 Ayre et al, 'A Guide to Broadband Technologies', *The Australian Economic Review*, vol. 43, no. 2, June 2010, p. 201.

9 Ayre et al, 'A Guide to Broadband Technologies', *The Australian Economic Review*, vol. 43, no. 2, June 2010, p. 201.

10 McKinsey-KPMG, *National Broadband Network Implementation Study*, 2010, p. 12.

11 See Regional Telecommunications Independent Review Committee (RTIRC), *Framework for the Future*, September 2008, pp. 217-221.

9. Thirdly, and most importantly, the speeds of DSL connections vary significantly depending on the distance of the premises from the local telephone exchange. This is due to loss of signal along the copper lines. Premises very close to an ADSL 2+ enabled exchange may obtain download speeds of over 20 Mbit/s, while those several kilometres from an exchange may only receive 1 to 2 Mbit/s, or not be able to receive DSL broadband at all.<sup>12</sup> The deteriorated condition of copper lines also reduces the quality of DSL services in many areas.<sup>13</sup>

## Wireless broadband

10. Wireless broadband has been rapidly increasing in popularity in recent years. It uses a range of technologies to transmit data to users' devices without the need for a telephone line or other fixed line service to their premises.
11. There are two main types of wireless broadband technologies: fixed wireless and mobile wireless. Fixed wireless refers to services that are designed to be transmitted to premises equipped with a fixed antenna (often externally). Mobile broadband services transmit to small portable devices such as 'smart phones' and laptops.<sup>14</sup>
12. While fixed wireless does not currently exist on a large scale in Australia,<sup>15</sup> mobile broadband has become increasingly popular in recent years. The numbers of subscribers to mobile broadband services have increased from less than 500 000 in December 2007 to over 4.2 million in December 2010, and as a proportion of total broadband subscriptions, mobile broadband has increased from 7 per cent to around 41 per cent over this period.<sup>16</sup>
13. The NBN Implementation Study puts the current growth in mobile broadband subscriptions down to a number of temporary factors, including recent price drops, rapid take-up in the business sector and poor fixed line broadband services.<sup>17</sup> The ongoing substitution of standard mobile phones with smart phones and other devices has clearly also

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12 McKinsey-KPMG, *National Broadband Network Implementation Study*, 2010, p. 60.

13 For example, see Mr Steven Harrison, Director, Business and Economic Development, City of Prospect, *Committee Hansard*, Adelaide, 4 April 2011, p. 65.

14 Alcatel-Lucent, *The National Broadband Network: a glossary of terms*, 2010.

15 ABS data indicates there were around 33 000 subscribers to fixed wireless broadband services in Australia in June 2010. See ABS, 'Table 2 Internet subscribers by type of access connection, for all ISPs', *8153.0 - Internet Activity Australia*, December 2010.

16 ABS, 'Table 1 Internet subscribers by type of access connection, for ISPs with more than 1,000 active subscribers', *8153.0 - Internet Activity Australia*, December 2010.

17 McKinsey-KPMG, *National Broadband Network Implementation Study*, 2010, pp. 232-234.

increased the number of connections. The Implementation Study notes that the vast majority of mobile broadband customers also have a fixed line broadband service.<sup>18</sup> ABS data shows that fixed line services still account for over 91 per cent of all data downloaded in Australia, compared to less than 9 per cent for wireless.<sup>19</sup>

14. With denser tower distribution and more effective receiving antennas, fixed wireless is capable of providing faster speeds and more consistent performance than mobile wireless broadband, particularly if external antennas are attached to premises.<sup>20</sup> However, both types of wireless technology are affected by geography, with performance dropping with distance from a tower and due to physical barriers such as hills and trees. Users of wireless broadband must also share capacity, meaning the more people that are using their connection the lower the performance (this is known as 'contention'). For these reasons, fixed wireless broadband is considered a suitable alternative to fixed line services in areas with lower population densities where it is not economical to provide fixed line broadband infrastructure.<sup>21</sup>
15. These ISP-delivered wireless broadband services should not be confused with short-range wireless technologies such as Wi-Fi. Wireless Local Area Networks in homes, workplaces and publicly accessible wireless 'hot spots', such as in cafes and libraries, almost always use a wireless router that is attached to a fixed line broadband connection.

## Other broadband technologies

16. Hybrid Fibre Coaxial (HFC) cable broadband, often known simply as 'cable', is available to many consumers in larger cities, primarily using Telstra and Optus networks.<sup>22</sup> This service uses the same infrastructure as that which delivers cable subscription television services, and can deliver very fast broadband speeds with only negligible loss of signal. It uses fibre optic cables to transfer data to nodes close to premises, then coaxial cable for the 'last mile' of transfer from the node to premises.<sup>23</sup>

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18 McKinsey-KPMG, *National Broadband Network Implementation Study*, 2010, p. 233.

19 ABS, 'Volume of data downloaded by access connection, for ISPs with more than 1,000 active subscribers', 8153.0 - *Internet Activity Australia*, December 2010.

20 McKinsey-KPMG, *National Broadband Network Implementation Study*, 2010, pp. 12, 274-276.

21 McKinsey-KPMG, *National Broadband Network Implementation Study*, 2010, p. 280.

22 Availability is estimated at 20 per cent of the population; see McKinsey-KPMG, *National Broadband Network Implementation Study*, 2010, pp. 21, 135.

23 McKinsey-KPMG, *National Broadband Network Implementation Study*, 2010, p. 21.

17. HFC is essentially a proprietary form of fibre-to-the-Node (FTTN), which is the generic name for infrastructure where fibre is laid out to equipment 'nodes' in each neighbourhood rather than all the way to individual premises. HFC is more widely deployed in Europe and North America than in Australia.<sup>24</sup> The NBN Implementation Study notes that while HFC is capable of providing fast broadband connections, compared to alternative technologies there are questions about its ability to provide a wholesale open-access network, keep pace with future bandwidth requirements and, due to its higher contention ratios, deliver reliable average speeds and enterprise-grade services to customers.<sup>25</sup>
18. Satellite broadband currently has around 111 000 subscribers in Australia,<sup>26</sup> mainly provided through IPSTAR and Optus. Current satellite services are slow compared with other technologies, and performance suffers from high 'latency', a delay in response time caused by the distances that signals need to travel to reach and return from satellites orbiting around 36 000 kilometres above the earth.<sup>27</sup> However, satellite broadband is often the only viable broadband option for many people in remote areas. Current satellite broadband services are provided by geostationary (GEO) satellites operating over the Ku band. Under the Government's Australian Broadband Guarantee program, which ended in June 2011, residential and small business premises in locations unable to access 'metro-equivalent' broadband services were able to access satellite broadband services at a subsidised price.<sup>28</sup>
19. Fibre-optic cable, or just 'fibre' for short, is made of thin threads of glass that carry data in the form of pulses of light. As fibre is less susceptible to 'noise' and 'interference' than other technologies, it is able to transfer large amounts of data over long distances without loss of quality or speed.<sup>29</sup> A single fibre is capable of extremely high bandwidth transmission, with recent studies demonstrating speeds of over 100 *terabits* per second

24 McKinsey-KPMG, *National Broadband Network Implementation Study*, 2010, p. 135.

25 McKinsey-KPMG, *National Broadband Network Implementation Study*, 2010, pp. 105–108, provides a discussion of the issues around HFC and its potential use as an 'interim' solution in some areas.

26 ABS, 'Table 1 Internet subscribers by type of access connection, for ISPs with more than 1,000 active subscribers', 8153.0 – *Internet Activity Australia*, December 2010.

27 McKinsey-KPMG, *National Broadband Network Implementation Study*, 2010, p. 277.

28 For details refer to *Australian Government*, 'Australian Broadband Guarantee: Program Guidelines 2010-11', July 2010  
<[http://www.dbcde.gov.au/\\_\\_data/assets/pdf\\_file/0017/128204/Australian-Broadband-Guarantee-2010-11-Guidelines-July-2010.pdf](http://www.dbcde.gov.au/__data/assets/pdf_file/0017/128204/Australian-Broadband-Guarantee-2010-11-Guidelines-July-2010.pdf)> viewed 18 July 2011.

29 Alcatel-Lucent, *The National Broadband Network: a glossary of terms*, 2010, p. 5.

(100 000 000 Mbit/s).<sup>30</sup> The actual speed of transmission depends on the equipment that is installed in exchanges, aggregation points and end user premises.<sup>31</sup>

20. Fibre is already used extensively in backhaul telecommunications networks, including international submarine cables. Fibre is also increasingly being used for network connections closer to individual premises. Fibre-to-the-premises (FTTP) refers to fibre delivered all the way to an individual home or business (the 'last mile'), eliminating any dependence on copper cabling. FTTP has been increasingly made available in new developments, and many large businesses and public institutions, including schools, universities and hospitals, also already have fibre connections,<sup>32</sup> although these connections are often under-utilised due to cost barriers.<sup>33</sup>

## Overview of the NBN

21. The National Broadband Network (NBN), as announced by the Federal Government on 7 April 2009, promised to deliver a 'super fast' FTTP network delivering broadband services of up to 100 Mbit/s to 90 per cent of Australian premises, with the remaining 10 per cent to be serviced by wireless broadband with speeds of at least 12 Mbit/s.<sup>34</sup>
22. Shortly after the announcement, NBN Co was established as a wholly government-owned company to build and operate the NBN. Mr Mike Quigley was appointed as NBN Co's Chief Executive Officer on 25 July 2009.<sup>35</sup>

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30 New Scientist, 'Ultrafast fibre optics set new speed record', 29 April 2011 <<http://www.newscientist.com/article/mg21028095.500-ultrafast-fibre-optics-set-new-speed-record.html>> viewed 18 July 2011.

31 See Ayre et al, 'A Guide to Broadband Technologies', *The Australian Economic Review*, vol. 43, no. 2, June 2010, pp. 203-204.

32 Paul Budde Communication Pty Ltd, *Australia - National Broadband Network - Critical Considerations*, 29 April 2009, p. 3.

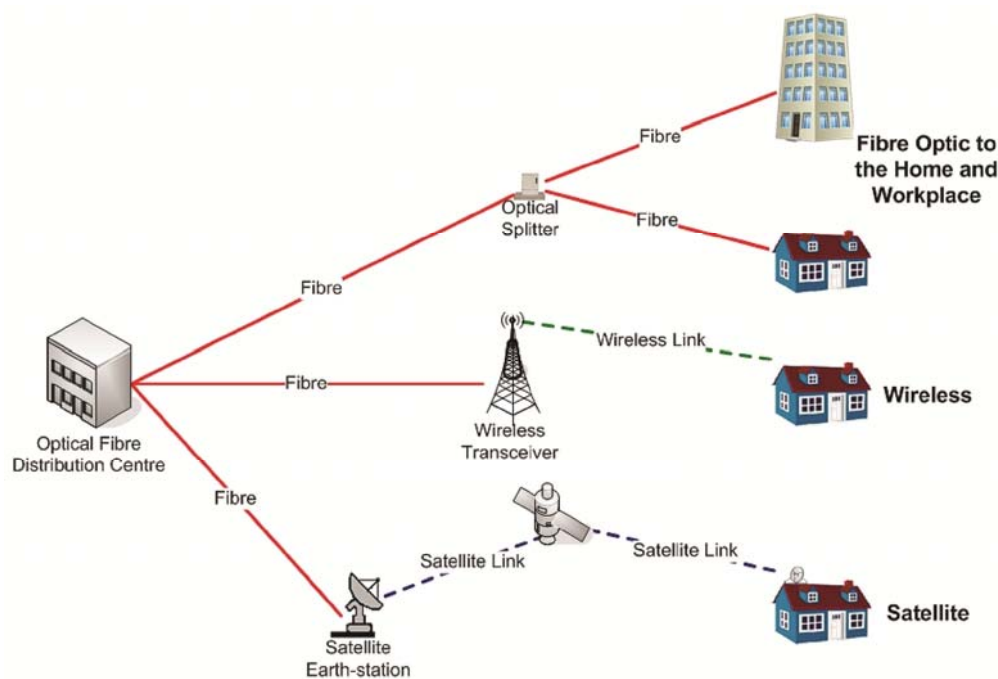
33 The Department of Education, Employment and Workplace Relations (DEEWR) estimates that 63.4 per cent of schools and 80 per cent of TAFEs have fibre connections, but download speeds often remain slow due to pricing and contract issues. See Australian ICT in Education Committee (AICTEC), *Submission 124*, pp. 10-11.

34 Prime Minister, Treasurer, Minister for Finance and Minister for Broadband, 'New National Broadband Network', *Joint Media Release*, 7 April 2009.

35 NBN Co, 'History' <<http://www.nbnco.com.au/wps/wcm/connect/main/site-base/resources/about-nbn-co/history-of-nbnco/>> viewed 18 July 2011.

23. In August 2009, McKinsey-KPMG was appointed by the Government as the Lead Advisor for the NBN's Implementation Study.<sup>36</sup> The Government released the Implementation Study in May 2010.<sup>37</sup> Among other things, the study recommended the FTTP component of the NBN plan should be extended to 93 per cent of households. Fixed wireless technology would deliver broadband to another 4 per cent of households, and next generation satellite technology would service the remaining 3 per cent of the population. Figure A.2 below gives an overview of the type of infrastructure to be used, and Figure A.3 shows NBN Co's indicative coverage map of each type of technology. The government's official response to the Implementation Study, accepting its key recommendations, was publically released on 20 December 2010.<sup>38</sup>

Figure A.2 NBN technologies



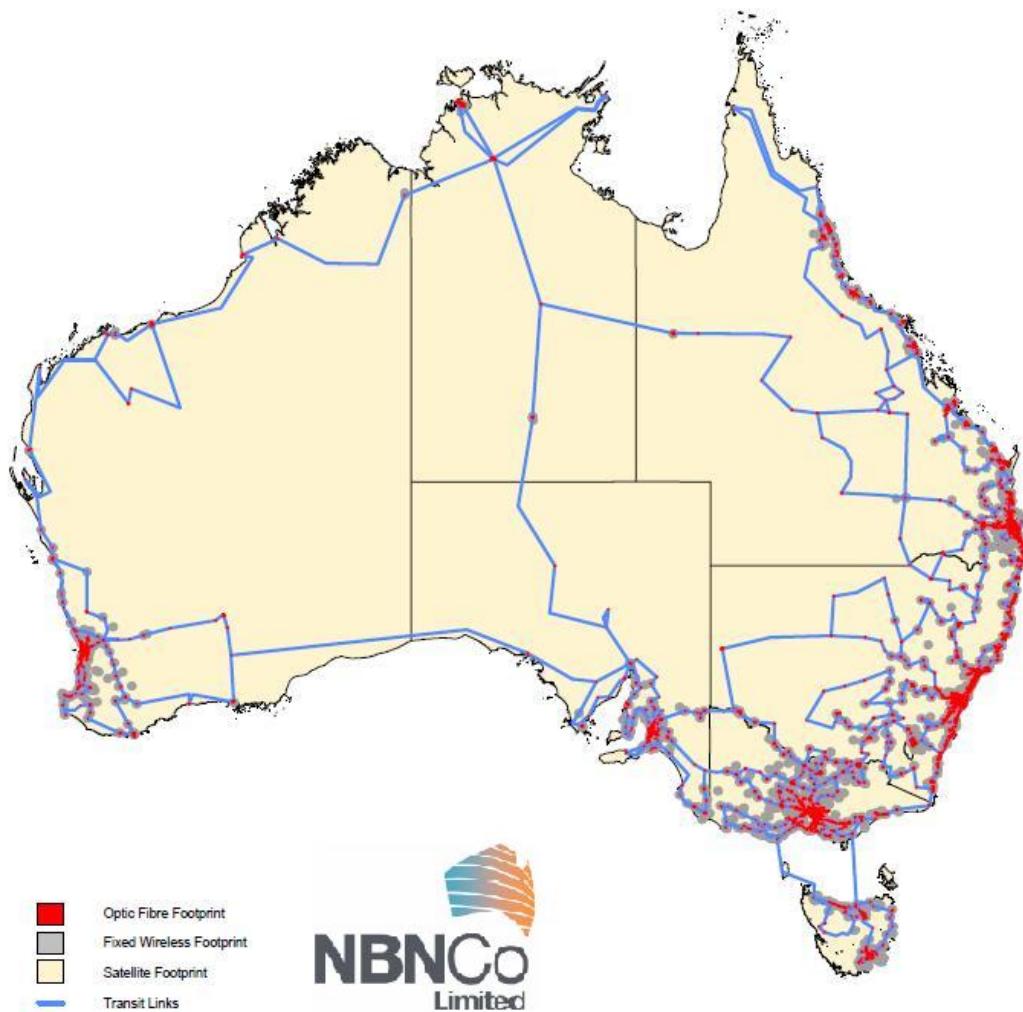
Source Australian Government, '21<sup>st</sup> Century broadband'

<[http://www.dbcde.gov.au/\\_data/assets/pdf\\_file/0005/110012/National\\_Broadband\\_Network\\_policy\\_brochure.pdf](http://www.dbcde.gov.au/_data/assets/pdf_file/0005/110012/National_Broadband_Network_policy_brochure.pdf)> viewed 14 January 2011.

- 36 Senator the Hon Stephen Conroy, 'McKinsey-KPMG appointed Lead Advisor for National Broadband Network', *Media Release*, 6 August 2009.
- 37 See DBCDE, 'National Broadband Network Implementation Study' <[http://www.dbcde.gov.au/funding\\_and\\_programs/national\\_broadband\\_network/national\\_broadband\\_network\\_implementation\\_study](http://www.dbcde.gov.au/funding_and_programs/national_broadband_network/national_broadband_network_implementation_study)> viewed 18 July 2011.
- 38 Senator the Hon Penny Wong, Minister for Finance and Deregulation and Senator the Hon Stephen Conroy, Minister for Broadband, Communications and the Digital Economy, 'Statement of Expectations', *Joint Ministerial Direction*, 17 December 2010.



Figure A.3 Indicative coverage of NBN fibre, wireless and satellite services



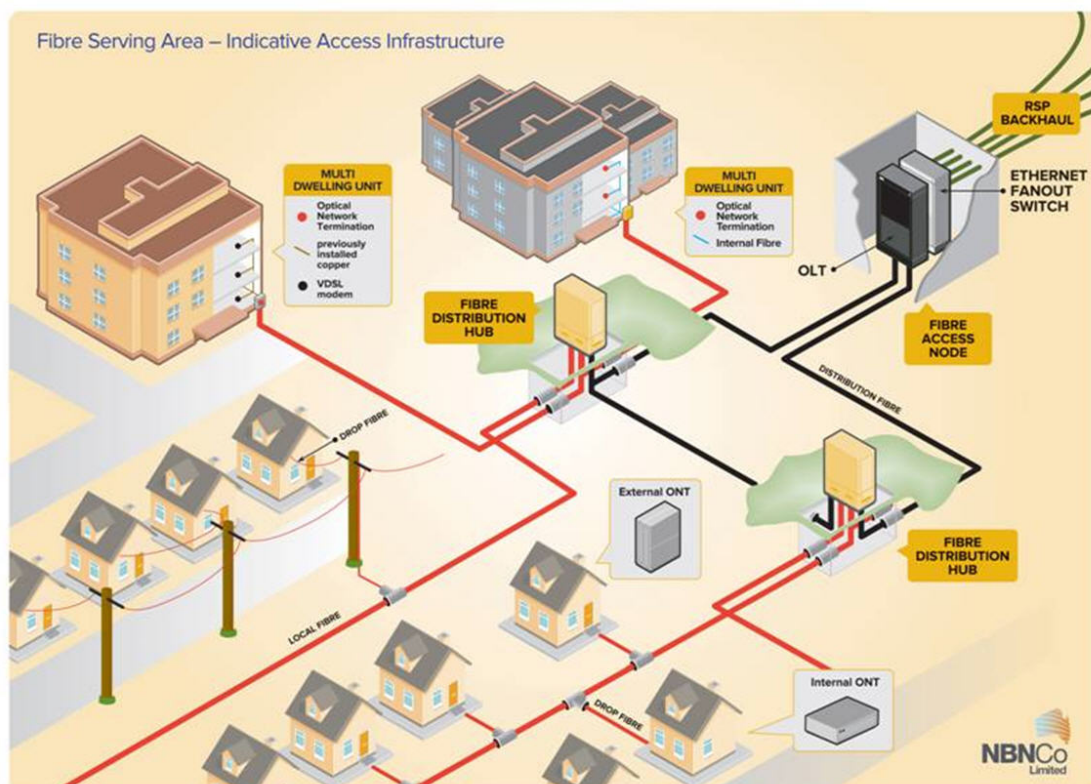
Source NBN Co website <<http://www.nbnco.com.au/our-network/maps.html>>

24. The NBN will be an 'open access' network, which means that NBN Co will be a wholesale-only company that provides the basic fibre infrastructure and a 'Layer 2 bitstream' service, which retail service providers (RSPs) will be able to draw upon on an equal basis.<sup>39</sup> Only RSPs will deal with end-user customers and offer a range of higher level products. This structure is different from the 'vertically integrated' structure currently in place for most of the existing copper network, in which Telstra is both the wholesale infrastructure owner and a retail service provider. The fibre-based NBN, which will eventually replace the copper network, will therefore structurally reform the telecommunications industry in addition to providing new infrastructure.

<sup>39</sup> NBN Co, *Corporate Plan 2011–2013*, pp. 12, 49.

25. Figure A.4 gives an overview of the typical infrastructure that will be used to deliver the NBN's fibre network in each of around 980 fibre serving areas (FSAs) around Australia.<sup>40</sup> The NBN distribution fibre will connect to retail backhaul networks at what is known as a Point of Interconnect (PoI) (the Fibre Access Node shown in Figure A.4 incorporates a PoI).

Figure A.4 Indicative NBN infrastructure design: a typical Fibre Service Area (with POI)



Source NBN Co, Consultation Paper: Connecting to the National Broadband Network (Fibre Network), 25 October 2010 < <http://www.nbnco.com.au/assets/documents/connecting-to-the-fibre-network.pdf> > viewed 22 August 2011.

26. Following extensive public debate and the Australian Competition and Consumer Commission (ACCC) advice on the matter, in December 2010 the government and NBN Co announced that there would be initially 120 PoIs, only in locations that have competitive backhaul available. This 'semi-distributed' model was designed to balance the competing goals of competition on backhaul infrastructure with the Government's commitment to uniform national wholesale pricing across Australia.<sup>41</sup> For

40 NBN Co, *Corporate Plan 2011–2013*, p. 79.

41 See Penny Wong and Stephen Conroy, *Statement of Expectations*, 17 December 2010 and Australian Competition and Consumer Commissions, *ACCC Advice to Government: National Broadband Network Points of Interconnect*, November 2010.

Fibre Access Nodes without a PoI, the NBN will supply its own 'transit' backhaul fibre to the nearest PoI.

27. Downstream from the Fibre Access Node, distribution fibre will be laid out to connect a network of Fibre Distribution Hubs, each connecting to around 200 premises using local and drop fibre. Gigabit Passive Optical Network (GPON) technology will be used to deliver fibre connections capable of speeds of around 2500 Mbit/s downstream and 1250 Mbit/s upstream, shared by up to 32 premises.<sup>42</sup> Given that not all connections are likely to be used simultaneously and that data is usually transmitted in bursts not continuously, GPON is capable of fulfilling the government's requirement of providing speeds in excess of 100 Mbit/s to each of the 32 premises being served.
28. As demand for bandwidth increases in the future, it would be relatively inexpensive to replace the GPON components with newer technology that allows for even more bandwidth over the same fibre network.<sup>43</sup> NBN Co has also indicated that point-to-point (PtP) fibre connections will be made available for some business users, meaning bandwidth would not need to be shared with other premises at all.<sup>44</sup>
29. The fibre cables that make up the network will be primarily underground, although around 25 per cent of premises will have overhead cables.<sup>45</sup> Each of the premises on the network will be equipped with an internal or external Optical Network Termination (ONT). Multi-dwelling units (MDUs), such as apartment blocks, will be equipped with fibre to individual premises using internal fibre.<sup>46</sup> Individual householders may connect their devices through to the ONT (or a connected internal device) using standard telephone or Ethernet cables, or by setting up a local wireless network using a wireless router.
30. On 1 June 2011, NBN Co announced that it had signed a 10 year contract with Ericsson to build and operate the fixed wireless component of the NBN using 4G Long Term Evolution (LTE) technology.<sup>47</sup> The fixed

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42 NBN Co, *Corporate Plan 2011-2013*, p. 49; Paul Budde Communication, *Australia – National Broadband Network – NBN Co and Infrastructure*, 15 November 2010, p. 6.

43 Ayre *et al*, 'A Guide to Broadband Technologies', *The Australian Economic Review*, vol. 43, no. 2, June 2010, p. 204. See also NBN Co, *Corporate Plan 2011-2013*, p. 75 for a discussion of the potential upgrade path for the fibre network, potentially delivery speeds of 100 Gbit/s by 2030–35.

44 NBN Co, *Corporate Plan 2011-2013*, p. 135.

45 NBN Co, *Corporate Plan 2011-2013*, p. 52.

46 NBN Co, *Corporate Plan 2011-2013*, p. 49.

47 NBN Co, 'NBN Co selects fixed wireless network partner for mid-2012 service start', *Media Release*, 1 June 2011.

wireless network will offer peak speeds of 12 Mbit/s and is expected to begin offering services from mid-2012, with the network complete by 2015. In February 2011, NBN Co had announced that it had acquired 2.3 GHz and 3.4 GHz spectrums from AUSTAR,<sup>48</sup> and additional spectrum was purchased in July 2011.<sup>49</sup> The first communities to receive fixed wireless NBN services are expected to be the areas surrounding Ballarat, Darwin, Geraldton, Tamworth and Toowoomba.<sup>50</sup>

31. At the time of writing, the precise details of the satellite broadband service that will be delivered to the remaining three per cent of the population had not yet been announced. The NBN Implementation Study recommends that NBN Co launch two 'next-generation' GEO satellites operating over the Ka band, which would provide substantially better service than the current Ku band satellites and meet the objective of delivering broadband with peak speeds of at least 12 Mbit/s download across the country. However, mainly due to the latency effect inherent in high-orbiting satellites, it is expected that satellite broadband will only be taken up by customers who cannot access fibre or wireless services.<sup>51</sup>
32. Given that the time taken to design and launch a new satellite is around three to four years,<sup>52</sup> NBN Co began offering an interim satellite solution in July 2011 using spare capacity on existing satellites.<sup>53</sup> The Interim Satellite Service is a substitute for the Government's expiring Australian Broadband Guarantee program, and delivers peak speeds of around 6 Mbit/s. The long term satellite solution is expected to be deployed by 2015.<sup>54</sup>

## The NBN fibre roll out plan

33. NBN Co plans to achieve full roll out the NBN by 2021, around nine and a half years after completion of the mainland first release sites.<sup>55</sup> Although

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48 NBN Co, 'NBN Co acquires AUSTAR spectrum for rural and regional network', *Media Release*, 17 February 2011.

49 NBN Co, 'Spectrum win brings wireless broadband to rural areas', *Media Release*, 13 July 2011.

50 NBN Co, 'First communities for National Broadband Network fixed wireless service unveiled', *Media Release*, 3 August 2011.

51 McKinsey-KPMG, *National Broadband Network Implementation Study*, 2010, p. 294.

52 McKinsey-KPMG, *National Broadband Network Implementation Study*, 2010, p. 293.

53 NBN Co, 'NBN Co launches Interim Satellite Service for remote Australians', *Media Release*, 1 July 2011.

54 NBN Co, *Corporate Plan 2011-2013*, pp. 21, 71-72.

55 NBN Co, *Corporate Plan 2011-2013*, p. 77.

precise fibre coverage details will not be known until later in the construction period, NBN Co has indicated that fibre will be deployed to all mainland communities with over 1000 premises, in addition to communities with more than 500 premises that are passed by transit backhaul routes.<sup>56</sup> NBN Co has also announced that it is trialling a fibre extension program in early roll out sites in Tasmania, in which premises outside the proposed fibre footprint can be connected with fibre if they agree to pay the additional incremental cost involved.<sup>57</sup>

34. The Regional Backbone Blackspots Program (RBBP) is being funded by the government to fill gaps in existing fibre 'backbone' infrastructure that will be utilised under the NBN. The term 'backbone' refers to the main backhaul fibre routes that connect major towns and cities. Locations to be linked include Longreach and Emerald in QLD, Geraldton in WA, Darwin in NT, Broken Hill in NSW, Victor Harbor in SA and South West Gippsland in VIC. All links are expected to be in place by the end of 2011. As of July 2011, the RBBP links to Geraldton, Victor Harbor and South West Gippsland had been completed, enabling new services to be provided by ISPs in those locations.<sup>58</sup>
35. On 8 April 2009, the government announced that the NBN would begin being rolled out in Tasmania.<sup>59</sup> In July 2009, Smithton, Scottsdale and Midway Point were announced as the 'Stage 1' pre-release trial sites where the roll out would begin. NBN Tasmania Limited was created to oversee the wholesale roll out of the network in Tasmania and was established as a wholly owned subsidiary of NBN Co.<sup>60</sup> Seven more 'Stage 2' towns were announced in October 2009,<sup>61</sup> and four larger 'Stage 3' locations in March 2010.<sup>62</sup> Figure A.5 shows the location of these sites.

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56 See NBN Co, *Corporate Plan 2011-2013*, pp. 63-64 for detailed coverage maps.

57 Mr Mike Quigley, Chief Executive Officer, NBN Co, *Committee Hansard*, Sydney, 29 April 2011, p. 4.

58 Department of Broadband, Communications and the Digital Economy (DBCDE), 'National Broadband Network: Regional Backbone Blackspots Program' <[http://www.dbcde.gov.au/broadband/national\\_broadband\\_network/national\\_broadband\\_network\\_Regional\\_Backbone\\_Blackspots\\_Program](http://www.dbcde.gov.au/broadband/national_broadband_network/national_broadband_network_Regional_Backbone_Blackspots_Program)> viewed 18 July 2011.

59 Prime Minister, Premier of Tasmania, Minister for Broadband, 'Tasmania first to receive superfast broadband', *Joint Media Release*, 8 April 2009.

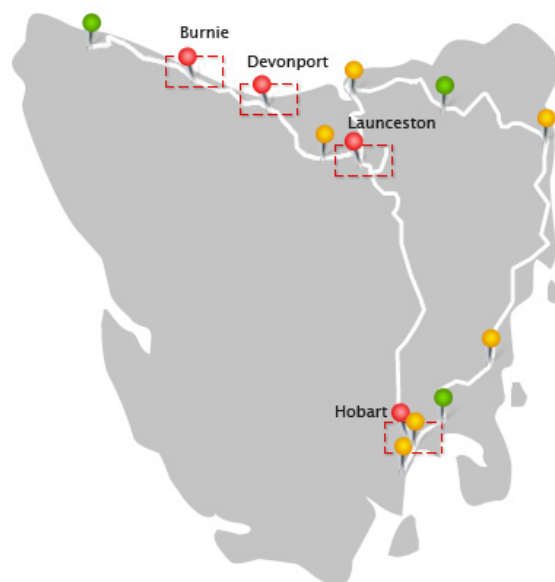
60 Prime Minister, Premier of Tasmania, Minister for Broadband, 'Smithton, Scottsdale and Midway point first towns for National Broadband Network in Tasmania', *Joint Media Release*, 25 July 2009.




61 Prime Minister, Premier of Tasmania, Minister for Broadband, 'Seven new locations to receive superfast broadband in Tasmania', *Joint Media Release*, 21 October 2009.

62 Senator the Hon Stephen Conroy, Minister for Broadband, Communications and the Digital Economy, '\$100 million injected into NBN Tas as Stage 3 roll out is announced', *Media Release*, 1 March 2010.

NBN trial services were launched in the Stage 1 sites in August 2010,<sup>63</sup> and construction start dates and fibre maps were released for the Stage 2 sites in April 2011.<sup>64</sup>

Figure A.5 NBN first, second and third stage rollout sites in Tasmania



 Stage 1 Communities	 Stage 2 Communities	 Stage 3 Communities
Midway Point Scottsdale Smithton	Deloraine George Town Kingston Beach Sorell South Hobart St Helens Triabunna	Burnie Devonport Hobart Launceston

Source Australian Government, National Broadband Network website < <http://www.nbn.gov.au/follow-the-rollout/tasmanian-rollout/> > viewed 19 July 2011.

36. On 2 March 2010, five 'first release' trial FTTP sites were announced for the mainland – Brunswick (Victoria), Townsville (Queensland), Minnamurra and Kiama Downs (NSW), Armidale (NSW) and Willunga (SA).<sup>65</sup> Fourteen more release sites around mainland Australia (and extended coverage in the five first release sites) were announced on 8 July 2010.<sup>66</sup> Figure A.6 shows the location of these sites. User trials of the first

63 NBN Tasmania Limited, 'Australia's first NBN opens in Tasmania – offers blistering speeds', *Media Release*, 12 August 2010.

64 NBN Co, 'Construction to start on NBN in next seven Tasmanian locations', *Media Release*, 28 April 2011.




65 NBN Co, 'NBN Co announces "first release" sites for high-speed network', *Media Release*, 2 March 2010.

66 NBN Co, 'NBN Co announces next rollout locations', *Media Release*, 8 July 2010.

mainland services (beginning in Armidale) were launched by the Prime Minister on 18 May 2011.<sup>67</sup>

Figure A.6 NBN first release and RBBP locations on mainland Australia



 RBBP priority location	 First release sites	 Second release sites
Geraldton (WA) Darwin (NT) Victor Harbor (SA) Emerald (QLD) Longreach (QLD) Broken Hill (NSW) Sale (VIC) Wonthaggi (VIC)	Willunga (SA) Townsville (QLD) Armidale (NSW) Kiama Downs (NSW) Brunswick (VIC)	Gungahlin (ACT) Riverstone (NSW) Coffs Harbour (NSW) Casuarina (NT) Inner North Brisbane (QLD) Springfield Lakes (QLD) Toowoomba (QLD) Modbury (SA) Prospect (SA) Bacchus Marsh (VIC) South Morang (VIC) Geraldton (WA) Mandurah (WA) Victoria Park (WA)

Source Australian Government, National Broadband Network website < <http://www.nbn.gov.au/follow-the-rollout/australian-mainland-rollout/> > viewed 19 July 2011.

37. Figures A.7 and A.8 provide an indication of the expected deployment timeframes for the NBN.

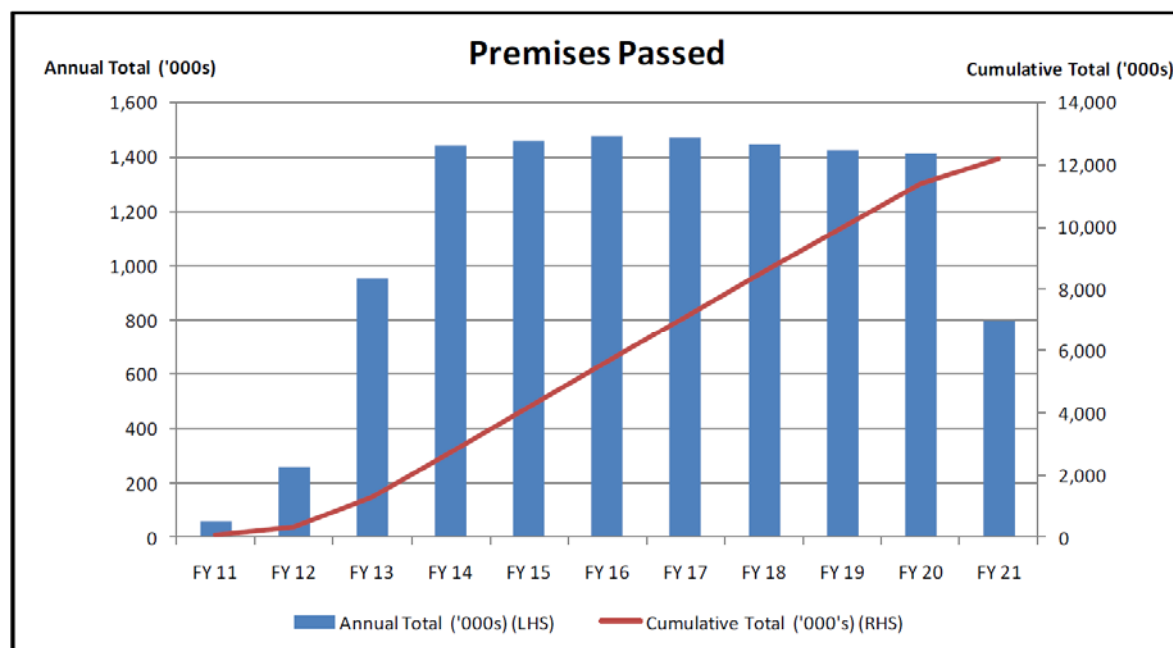
67 Prime Minister, 'Historic launch of NBN in Armidale', Media Release, 18 May 2011.

Figure A.7 NBN Deployment Schedule to FY2021

Deployment Schedule to FY2021											
June YE	FY2011	FY2012	FY2013	FY2014	FY2015	FY2016	FY2017	FY2018	FY2019	FY2020	FY2021
(Premises)											
Fibre Premises Passed ('000s)	58	316	1,268	2,711	4,173	5,647	7,116	8,564	9,989	11,403	12,202
Fibre Premises Passed Daily Run Rate (250 Working Days / Year)	0	1	4	6	6	6	6	6	6	6	3
Fibre Premises Connected ('000s)	35	137	511	1,589	2,616	3,679	4,712	5,708	6,672	7,623	8,320
Fibre Premises Connected Daily Run Rate (250 Working Days / Year)	0	0	1	4	4	4	4	4	4	4	3
Wireless & Satellite Premises Covered ('000s)	165	179	447	545	770	813	858	904	950	962	974
Wireless & Satellite Premises Connected ('000s)	0	13	55	102	151	165	181	198	215	222	229
<b>Total Premises Connected - All Platforms</b>	<b>35</b>	<b>150</b>	<b>566</b>	<b>1,691</b>	<b>2,767</b>	<b>3,845</b>	<b>4,893</b>	<b>5,905</b>	<b>6,887</b>	<b>7,845</b>	<b>8,549</b>

Source NBN Co, Corporate Plan 2011-2013, p. 77.

Figure A.8 NBN Fibre Premises Passed Targets



Source NBN Co, Corporate Plan 2011-2013, p. 83.

38. NBN Co has divided the network into 16 Roll-out Regions in which fibre will be deployed concurrently during the full scale construction period.<sup>68</sup> Precise details of when each area can expect to be connected to the fibre network have not yet been announced.
39. During the rollout of the NBN to existing premises, it is estimated that an addition 2 million new 'greenfields' premises will be constructed.<sup>69</sup> Under the government's policy announced on 9 December 2010, NBN Co will be responsible for installing fibre at all broadacre developments (i.e. those in

68 NBN Co, Corporate Plan 2011-2013, p. 79.

69 NBN Co, Corporate Plan 2011-2013, p. 23.



previously undeveloped areas) and at infill developments (i.e. those in areas which are already developed) with 100 or more premises.<sup>70</sup> NBN Co intends to procure contractors to deliver fibre to these developments.<sup>71</sup> Telstra will remain responsible for providing infrastructure (primarily copper) to infill developments with less than 100 premises.

40. On 23 June 2011, NBN Co signed binding definitive agreements with Telstra to help facilitate the efficient rollout of the NBN.<sup>72</sup> Under the agreements, Telstra will progressively migrate its customers over to the NBN fibre network as it is rolled out and NBN Co will be given access to Telstra's existing infrastructure, including lead-in conduits, pits, ducts, backhaul fibre and exchange space. The deal is subject to approval by Telstra shareholders and review by the ACCC. On the same day, NBN Co also announced it had signed a binding agreement with Optus (also subject to ACCC review).<sup>73</sup> Under that agreement, Optus has agreed to migrate its HFC customers to the NBN and decommission the non-essential parts of its HFC network.

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70 Senator the Hon Stephen Conroy, Minister for Broadband, Communications and the Digital Economy, 'Provision of Fibre in New Developments', *Media Release*, 9 December 2010.

71 NBN Co, *Corporate Plan 2011-2013*, p. 46.

72 NBN Co, 'NBN Co and Telstra Sign Binding Definitive Agreements', *Media Release*, 23 June 2011.

73 NBN Co, 'NBN Co and Optus Sign Binding Agreement', *Media Release*, 23 June 2011.





## Appendix B – Glossary of Terms<sup>1</sup>

<b>Access Seekers</b>	A generic term used by NBN Co to refer to customers of the network infrastructure, be they Retail Service Providers (RSPs) or Wholesale Service Providers (WSPs).
<b>Asymmetric Digital Subscriber Line (ADSL)</b>	A technology designed to give basic broadband performance over copper telephone lines, allowing more data to be sent than with dial-up internet. Speeds range from 256 kbit/s to about 8 Mbit/s, with the higher speeds available only over short, good quality copper lines. Download speeds are higher than upload speeds.
<b>ADSL2</b>	A marginally faster version of ADSL. The speed improvement is due to smarter chips being more adept at isolating signals from background noise that accumulates on a copper circuit. ADSL2 speeds reach up to 12 Mbit/s.
<b>ADSL2+</b>	An enhancement to ADSL2 that uses a wider frequency range to achieve substantially faster speeds, but only over short distances (less than about 1.5 km). ADSL2+ speeds reach up to around 25 Mbit/s.

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1 Except where otherwise noted, this glossary of terms has been compiled from the following source glossaries, plus original content:

- Alcatel-Lucent, 'The National Broadband Network: a glossary of terms, 2010' <[http://demo.idg.com.au/arn/arn\\_home\\_glossary.pdf](http://demo.idg.com.au/arn/arn_home_glossary.pdf)> viewed 14 January 2011.
- Tasmanian Electronic Commerce Centre, 'Glossary' <<http://www.tecc.com.au/knowledge/glossary.php>> viewed 14 January 2011.
- NBN Co, 'Glossary of Terms' <<http://www.nbnco.com.au/wps/wcm/connect/main/site-base/main-areas/our-network/glossary-of-terms/>> viewed 14 January 2011.
- Senate Select Committee on the National Broadband Network, *Fourth Interim Report*, May 2010, 'Glossary'.

<b>Australian Broadband Guarantee</b>	The Australian Broadband Guarantee was an initiative designed to help residential and small business premises access a metro-comparable broadband service regardless of where they are located. Under the Australian Broadband Guarantee, a metro-comparable broadband service is defined as any service that offers a minimum 1 Mbit/s download and 256 kbit/s upload data speed, 6GB per month data usage at a total cost of \$2500 GST inclusive over three years (including installation and connection fees). The program worked by paying internet service providers that registered with the program a subsidy to provide metro comparable broadband services to residential and small business premises where such services would not otherwise be available.
<b>Backbone</b>	Just as a major highway carries vehicles that started their journeys on many smaller roads around the country, a backbone network carries aggregated data across mid to long distances and between major centres.
<b>Backhaul</b>	Backhaul typically refers to the mid to long-distance transport of data from a series of disparate locations back to a more centralised location. The backhaul portion of the network comprises the intermediate links between the core, or backbone, of the network and the small sub-networks at the 'edge' of the entire hierarchical network. In the context of the NBN, backhaul services are the data carriage services provided over high-speed, high-capacity fibre lines, which carry aggregated network traffic between a Point of Interconnect (PoI) and a centralised or 'core' part of the network, for example an Internet Service Provider's data centre.
<b>Bandwidth</b>	Refers to the capacity and rate of data transfer over a network, usually measured in kilobits, megabits or gigabits per second.
<b>Bit</b>	An abbreviation of 'binary digit' – either a zero or a one. A single, basic piece of information or data used in relation to computing and telecommunications. Complex information (characters, numbers, email messages, documents, sound files, video files etc) can be stored and communicated as a sequence of bits.
<b>Bits per second</b>	A common measurement of the data speed when transmitting electronic data. The speed of Australian internet service plans are usually advertised in megabits per second.

<b>Bitstream</b>	A generic term often used to describe low-complexity data transmission products. The National Broadband Network will offer a wholesale bitstream service to Retail Service Providers. A bitstream service can be modified, moved, disconnected or reconnected without requiring any changes to the physical infrastructure, which is shared by many users and providers. This means that an end-user can switch providers easily, add and delete service features quickly and even receive multiple services from different providers at the same time.
<b>Blackspot</b>	An under-served premises, or area, usually in remote or rural locations and sometimes on the edges of cities, which is unable to obtain adequate, metro-comparable broadband or other communications services. Reasons for blackspots are normally related to the limitations of technologies, geography or a lack of investment.
<b>Broadband</b>	Broadband is a term used to refer to ‘always on’ high speed Internet or other network access. In the past, broadband services and technologies were defined in terms of a capability to transfer information at higher rates than traditional dial-up services. Today broadband is more commonly associated with speeds equal to or greater than those provided by Asymmetric Digital Subscriber Line (ADSL), that is, a minimum download speed of 256 kbit/s and minimum upload speed of 64 kbit/s. Over time, the bandwidth capacity of broadband has vastly increased and there are now calls to revise the definition of broadband to eliminate lower speeds such as 256 kbit/s from the category altogether.
<b>Byte</b>	A unit of storage measurement – a byte is made up of 8 bits. All information is stored as bits and bytes, which determine the size of the document, picture, video clip or other file that users may wish to download or send via email. The storage capacity or the amount of data contained in a file, CD, DVD, hard disk or other device is usually expressed in terms of kilobytes, megabytes, gigabytes or terabytes.

<b>Cloud Computing</b>	Cloud computing is an Internet-based technology which stores information in servers and provides that information as an on demand service. Under cloud computing consumers can access all of their documents and data from any device with internet access such as a home or work PC, a mobile phone or other mobile internet enabled device. <sup>2</sup>
<b>Coaxial Cable</b>	An electrical cable consisting of an inner conductor surrounded by an insulating spacer, surrounded by an outer cylindrical conductor. It provides protection of signals from external electromagnetic interference and effectively guides signals.
<b>Dark Fibre</b>	It is the equipment at either end that dictates what capacity can be delivered over an optical fibre – ranging upwards from about 100 Mbit/s (at the low end). The term ‘dark fibre’ simply refers to optical fibre that is available for use and is provided without any equipment at either end. The term was originally used when talking about the potential network capacity of telecommunication infrastructure, but now also refers to the increasingly common practice of leasing fibre optic cables from a network service provider.
<b>Dial-up</b>	A type of internet connection that is established via a modem and standard telephone line, and requires the computer to dial a phone number for access. Although available to all premises with a telephone line, bandwidth is limited to around 56 kbit/s.
<b>Digital Divide</b>	The gap between people with effective access to digital and information technology and services, and those with very limited or no access at all. It refers both to a person’s physical access to technology and the resources and skills available to effectively use the technology. Often used in Australia to describe the different levels of communications service available between metropolitan and regional areas.

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2 Richard Hayes, *Valuing Broadband Benefits: A selective report on issues and options*, Melbourne Business School, University of Melbourne, 7 December 2010, p. 27.

<b>Digital Economy</b>	The digital economy is the world around us, business and social, enabled by broadband and digital technologies. It includes the infrastructure, access technologies, devices, online services, applications, digital tools, government and other information that are utilised by individuals and organisations in daily life and business transactions. The term is often used to describe the future environment that will be enabled by ubiquitous high-speed broadband. As digital technology and broadband-enabled services and applications become more entrenched, it will be difficult to separate Australia’s digital economy from the economy as a whole.
<b>Digital Education Revolution</b>	A program administered by the Department of Education, Employment and Workplace Relations to provide ICT equipment, training, high speed broadband and online resources to schools. Total funding for the program is \$2.4 billion over seven years (2008–2014), and in the May 2010 Budget \$200 million was provisionally allocated for 2013–14.
<b>Digital Subscriber Line (DSL)</b>	A family of broadband access technologies, the most common being asymmetric digital subscriber line (ADSL), that transfer data over existing copper telephone lines between a premises and its local exchange. The majority of Australia’s fixed line broadband services are currently delivered using DSL. It allows voice communication and high-speed data transmission on the same line at the same time. Varieties of DSL include ADSL2+ and VDSL (Very-High-Bitrate Digital Subscriber Line). DSL performance is limited by the distance a user is located from an exchange, the quality of copper network infrastructure and other technical constraints.
<b>Digital Subscriber Line Access Multiplexer (DSLAM)</b>	A unit of electronics that aggregates traffic from multiple customer loops onto a backhaul circuit. Located in an exchange and required for providing DSL services.
<b>Distribution Fibre</b>	NBN Co’s term for fibre laid between a Fibre Distribution Hub (FDH) and Fibre Access Node (FAN). Distribution Fibre routes are designed in a ring structure to minimise the impact of any fibre break on consumer services as well as providing diverse paths for protected commercial point-to-point services.

<b>Download or downloading</b>	A download is any activity that transfers data to your computer from another one. Viewing a web page is downloading, because all the words, pictures and links on that page have to be transferred to the user's computer and contributes to any download limits placed on the user's account by their Internet service provider. Other activities like retrieving emails, listening to music, watching a video or chatting online are also downloads.
<b>Drop fibre</b>	NBN Co's term for fibre stretching from a Local Fibre Network Access Point (NAP) to the termination point at individual premises.
<b>E-government</b>	The use of ICT technology to enhance the efficiency and effectiveness of the public sector.
<b>E-health</b>	The combined use in the health sector of electronic communication and information technology for clinical, educational and administrative purposes, both at the local site and at a distance. <sup>3</sup>
<b>E-learning</b>	Learning that is facilitated using computers, or using other digital tools and content.
<b>E-commerce</b>	The use of electronic communication technology by business to conduct transactions and other commercial functions.
<b>Ethernet</b>	A common network language, or 'protocol', used for the orderly transport of data usually inside home or office Local Area Networks (LANs). As well as the protocol, the term Ethernet also covers a definition of the plug/socket arrangement and type of cable used.
<b>Exchange</b>	A network hub, connecting premises in a local area into the telecommunications network. Exchanges are usually the terminating points for access networks and the point from which backbone networks extend to other major hubs. Typically also used to describe the physical building in which telecommunications equipment is housed.
<b>Fibre Access Node (FAN)</b>	NBN Co's term for a facility housing equipment that provides services to a Fibre Serving Area (FSA).

3 Access Economics, *Financial and externality impacts of high-speed broadband for telehealth*, July 2010.



<b>Fibre Distribution Area (FDA)</b>	NBN Co's term for the area served via a single Fibre Distribution Hub (FDH) which connects addresses to the serving FAN site(s) via Local Fibre.
<b>Fibre Distribution Hub (FDH)</b>	NBN Co's term for a facility that houses optical splitters and distributes fibre connections to premises.
<b>Fibre Optic</b>	Also known as optical fibre, fibre-optic cable is made up of thin threads of glass that carry beams of light. In telecommunications, data is translated into pulses of laser light that can be transmitted along the fibre cables. Fibre-optic technology is less susceptible to 'noise' and 'interference' than other data-transfer mediums such as standard copper telephone lines and can be used more reliably over longer distances without loss of speed or quality. Fibre is used extensively in backbone and international submarine networks, and to connect the base stations of mobile and wireless networks. It is increasingly being used for the last mile connection to home and business premises in FTTX networks.
<b>Fibre Serving Area (FSA)</b>	NBN Co's term for the area served by a Fibre Access Node (FAN) – a cluster of Fibre Distribution Areas (FDAs). The FDAs will be connected via Distribution Fibre.
<b>Fibre-to-the-Home (FTTH)</b>	Refers to networks in which fibre connections are provided all the way to individual households.
<b>Fibre-to-the-Kerb (FTTK)</b>	Refers to networks in which fibre connections are provided to a kerb-side equipment cabinet, in which the fibre's optical signal is converted to an electrical signal and delivered to premises over copper wires – typically over a maximum distance of 300 metres or less.
<b>Fibre-to-the-Node (FTTN)</b>	Similar to FTTK, but using a neighbourhood node that serves more premises rather than a kerb-side node. Copper distances are typically up to around 1 km.
<b>Fibre-to-the-Premises (FTTP)</b>	Similar to FTTH, but a more neutral term that includes non-residential premises, such as schools, hospitals, and workplaces, as well as households. Fibre connections are provided all the way to premises, including individual units in multi-dwelling buildings. The National Broadband Network is expected to provide FTTP to 93 per cent of Australian premises using primarily GPON technology.

<b>Fibre-to-the-X (FTTX)</b>	A generic term for any network architecture that uses optical fibre to replace all or part of the usual copper local loop used for telecommunications. FTTX technologies can offer very high bandwidth and are considered the most energy efficient way of providing broadband services.
<b>Fixed Line</b>	Fixed line refers to technologies that use physical infrastructure, such as copper wires, rather than wireless infrastructure to deliver data connections. Traditional voice services, dial-up internet, xDSL, HFC cable and FTTP are all forms of fixed line services. Replacing the existing copper fixed line access network in Australia with fibre is the largest part of the work to build the National Broadband Network.
<b>Fixed Wireless Broadband</b>	A family of wireless technologies that, as opposed to mobile wireless, delivers broadband services to a particular premises or fixed location. These services are sometimes called 'point-to-point' or 'point-to-multi-point', and require an antenna that is generally permanently attached to the user's building. Fixed wireless can be used for backhaul in certain cases but also as an access technology, particularly in rugged or remote terrain and areas with low population densities that may make a fixed line alternative impossible or uneconomic. Wireless technologies are limited by the availability of wireless spectrum, the number of concurrent users, distance from the cell antenna and physical impediments such as hills and valleys interrupting signals.
<b>Gigabit per second (Gbit/s)</b>	A measure of communications speed equal to 1 000 000 000 bits per second. Also expressed as Gbps and Gb/s.
<b>Gigabit Passive Optical Networking (GPON)</b>	A network technology standard that uses optical splitters to allow multiple premises to share a single piece of fibre optic cable. This results in large cost reductions and produces a much lower carbon footprint compared to non-shared FTTP networks and traditional broadband networks. The current generation of GPON technology provides 2.5 Gbit/s that typically is used to support 32 premises. The emerging XG-PON standard supports up to 10 Gbit/s while future enhancements are expected to increase bandwidth even further. NBN Co has indicated that GPON will be used for most of the fibre component of the National Broadband Network. Refer also to Passive Optical Network.

<b>Gigabyte (GB)</b>	A unit of information or computer storage meaning either exactly one billion bytes or approximately 1.07 billion bytes, depending on the context.
<b>Government 2.0</b>	The application of Web 2.0 collaborative tools to the business of government and the associated shift in public sector culture and practice towards more interaction and engagement with citizens. <sup>4</sup>
<b>Greenfield</b>	A term used to describe a piece of undeveloped land, either currently used for agriculture or completely unused.
<b>Hybrid Fibre Coaxial (HFC)</b>	A fixed line access technology combining fibre running to suburban nodes and then coaxial cable for the link between the node and premises. Originally deployed in Australia for subscription Cable TV services in parts of Sydney and Melbourne in the 1990s. Over recent years, most HFC networks have been upgraded for two-way traffic, supporting high speed data services and telephony.
<b>Internet</b>	A worldwide, publicly accessible series of interconnected computer networks that transmit data using the standard Internet Protocol (IP). It is a 'network of networks' that consists of millions of smaller domestic, academic, business, and government networks, which together carry various information and services, such as electronic mail, online chat, file transfer, and the interlinked web pages and other resources of the World Wide Web (www).
<b>Internet Protocol (IP)</b>	A set of communications and data routing standards supporting interconnection of networks and computers.
<b>Internet Protocol Television (IPTV)</b>	Television content that, instead of being delivered through traditional broadcast and cable formats, is received by the viewer through the technologies used for computer networks.

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4 See *Report of the Government 2.0 Taskforce*, Dec 2009: <http://www.finance.gov.au/publications/gov20taskforcereport/index.html> viewed 14 January 2011.

<b>Internet Service Provider (ISP)</b>	An organisation that offers access to the Internet to its customers. ISPs generally also provide other services such as electronic mail accounts, data storage and web hosting to their customers. ISPs may employ a combination of their own and third party infrastructure, or simply resell services provided by a wholesale carrier. Existing ISPs can be expected to become Retail Service Providers (RSPs) of the National Broadband Network.
<b>Intranet</b>	A network that uses the same kind of software as that used on the Internet, but is used by a company as a private network for internal use only.
<b>Kilobyte (kB)</b>	A unit of information or computer storage equal to either 1024 bytes or 1000 bytes, depending on the context. It is abbreviated in a number of ways: kB, KB, K and Kbyte.
<b>Kilobits per second (kbit/s)</b>	A measure of communications speed equal to 1000 bits per second. Also expressed as kbps, Kbps, kb/s and Kb/s.
<b>Killer app</b>	Short for 'killer application'. A ground-breaking application of technology that becomes so widely used that it justifies the technology on which it is based. For example, email could be considered the killer app of the internet.
<b>Last-mile Infrastructure</b>	Infrastructure used to provide the link from a customer's premises to the provider's nearest point of aggregation. For example, a provider offering a wireless broadband service to the customer would be providing last-mile infrastructure using wireless broadband technology.
<b>Latency</b>	The delay in data transmission caused by the time it takes for data to get from one designated point to another.
<b>Local area network (LAN)</b>	A LAN is a computer network limited to a small area such as an office building, university campus, or residential home. Although most LANs are Ethernet-based, Wireless LANs using technologies such as Wi-Fi, have become a popular alternative, including in the home.
<b>Local Fibre</b>	NBN Co's term for the cables between Fibre Distribution Hubs (FDHs) and individual premises via a series of radial fibre cables containing Network Access Points (NAPs) and Drop Fibre.

<b>Long-Term Evolution (LTE)</b>	LTE is the common emerging standard for mobile wireless telecommunications technology. The current generation of mobile telecommunication networks are collectively known as 3G (third generation). LTE is sometimes referred to as a 4G (fourth generation) technology. LTE is designed to increase the capacity and speed of mobile telephone networks to transmit data, allowing for higher upload and download speeds, support for larger numbers of active mobile devices per antenna site (cell), an improved end-user experience and a simple architecture.
<b>Loop</b>	Another term for the pair of copper wires over which telephony and xDSL services are delivered. Loop is often used synonymously with the terms line or circuit.
<b>Megabits per second (Mbit/s)</b>	A measure of communications speed equal to 1 000 000 bits per second. Also expressed as Mbps, mbps, Mb/s and mb/s.
<b>Megabyte (MB)</b>	A unit of information or computer storage equal to either 1 000 000 bytes or 1,048,576 bytes, depending on the context.
<b>Mobile Wireless and Mobile Broadband</b>	Broadband services supported by mobile networks, such as '3G' networks, offering mobility and flexibility for users of handheld and laptop devices. Wireless technologies are limited by the availability of wireless spectrum, the number of concurrent users, distance from the cell antenna and physical impediments such as hills and valleys interrupting signals.
<b>Multi Dwelling Unit (MDU)</b>	Typically refers to blocks of flats or apartments.
<b>Network</b>	A series of interconnected hardware components through which data is transmitted.
<b>Network Access Point (NAP)</b>	NBN Co's term for the point on a local fibre cable where the drop cable to an individual premises is connected.
<b>Next Generation Networking</b>	A broad term to describe some key architectural evolutions in telecommunication networks that will be deployed over the next five to 10 years. The general idea behind NGN is that one network transports all information and services (voice, data, and all sorts of media such as video).
<b>Node</b>	Either a connection or redistribution point for data transmission.

<b>Open Access Network (OAN)</b>	A horizontally layered network architecture and business model that separates physical access to the network from service provisioning. The open access model allows multiple service providers to compete over the same network at wholesale prices.
<b>Optical Fibre</b>	See Fibre Optic.
<b>Optical Network Terminal (ONT)</b>	A device, located on either the exterior or interior of the premises, used to connect each premises to an FTTP network. The ONT is the terminating point for the fibre-optic cable and provides a connection point for various in-building services, including Internet, telephone, video, wireless LAN and other emerging services and applications. Also often referred to as an NTU (Network Termination Unit).
<b>Passive Optical Network (PON)</b>	PON refers to an FTTP network architecture where unpowered optical splitters distribute light between one source and many destinations (downstream), or multiplexes light from multiple sources to one destination (upstream). This enables a single optical fibre to serve multiple premises, with the most common split ratio being 32:1. A PON configuration reduces the amount of fibre and central office equipment required compared with point-to-point architectures. Refer also to Gigabit Passive Optical Network.
<b>Point of Interconnect (PoI)</b>	The connection point that allows retail service providers (RSPs) and wholesale service providers (WSPs) to connect to NBN Co network infrastructure.
<b>Point-to-Point (P2P or PtP) Fibre</b>	In contrast to Passive Optical Network (PON), the provision of services to a premises by a non-shared fibre.
<b>Protocol</b>	The technical language and rule formats used to facilitate communications between computers. The most well-known protocol is Internet Protocol (IP). Within local area networks, a simpler protocol, defined as part of the Ethernet standard, is used.
<b>Quality of Service (QoS)</b>	The use of a range of networking technologies and techniques to provide guarantees on the ability of a network to deliver predictable results. Network performance within the scope of QoS can include availability, bandwidth, latency and error rate.

<b>Regional Backbone Blackspots Program</b>	A federally funded program to fill gaps in existing fibre backbone infrastructure that will be utilised under the NBN. Locations to be linked include Longreach and Emerald in QLD, Geraldton in WA, Darwin in NT, Broken Hill in NSW, Victor Harbor in SA and South West Gippsland in VIC. All links are expected to be in place by the end of 2011.
<b>Retail Service Providers (RSPs)</b>	RSPs and application/content service providers are those that have a direct relationship with users and provide them with services and applications. Wholesale service providers do not have this relationship. In the context of the National Broadband Network, an RSP could be responsible for any or all of customer sales and assistance, products, pricing, billing and the customer premises equipment that will enable phone calls, Internet, video services and other emerging applications to be delivered. A user may employ multiple RSPs for the provision different services and applications at the same time.
<b>Satellite Broadband</b>	Satellite broadband uses a home radio link and radio dish to bounce a signal off a satellite and down to an earth station. It is common in rural and remote areas with low population densities, where fixed line alternatives are uneconomic. One-way satellite connections utilise a satellite link to download data to the broadband user and a standard telephone connection for uploading data back to the Internet. Two-way satellite connections use the satellite link to both upload and download information. The suitability of satellite broadband for some applications is impacted by the large physical distances between satellites and the earth's surface, which results in latency (delay) in the sending and receipt of data. Quality may also be affected by the number of simultaneous users and adverse weather conditions.
<b>Shaping</b>	The practice of slowing data speed once the monthly data usage limit is reached.
<b>Smart Infrastructure</b>	The application of communications technologies to infrastructure to make better, more efficient use of resources. Smart infrastructure can be used within the transport, energy, communications and water sectors.

<b>Structural Separation</b>	The creation of separate companies with ownership controls which prevent retail service providers, including the incumbent's downstream businesses, from having effective control in the NBN infrastructure.
<b>Tele-commuting</b>	The use of information and telecommunications technology to facilitate working from home or other locations as a substitute for commuting to a central place of work.
<b>Tele-consultation</b>	Live consultations in a wide range of specialties ranging from dermatology and cardiology to psychiatry. Consultations may occur between medical professionals and patients, or among teams of medical professionals with or without patients – for example, between a GP and a specialist.
<b>Tele-education</b>	The application of information technology and telecommunications to educational and support services. In the tele-health context, it involves the transmission of medical information either for the training of health professionals or to assist members of the public to self-manage their health. <sup>5</sup>
<b>Tele-health</b>	A subset of e-health that includes the application of information technology and telecommunications for diagnostic and treatment services, educational and support services and the organisation and management of health services. Components include tele-homecare, tele-education, real time video consultations with specialists, and 'store and forward' transmission of medical data such as ECGs and x-rays. <sup>6</sup>
<b>Tele-presence</b>	The use of contemporary video-conferencing facilities that use high definition video, spatial audio and other techniques to closely emulate face to face interactions. <sup>7</sup>
<b>Tele-working</b>	Work that is conducted outside of the designated place of business, using telecommunications as a substitute for travel.
<b>Terabyte</b>	A unit of information or computer storage meaning either exactly one trillion bytes or approximately 1.1 trillion bytes, depending on the context.

5 Access Economics, *Financial and externality impacts of high-speed broadband for telehealth*, July 2010.

6 Access Economics, *Financial and externality impacts of high-speed broadband for telehealth*, July 2010.

7 Mal Bryce, *High Capacity Broadband: an Economic, Environmental and Social Imperative for 2009*, Feb 2009.



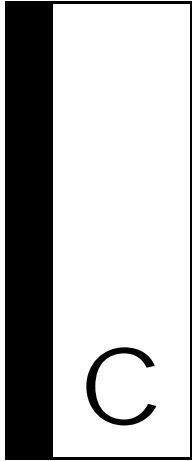
<b>Transit Fibre</b>	NBN Co's term for the fibre connection between Points of Interconnect (PoIs) and non-local Fibre Access Nodes.
<b>Twisted Pair</b>	A form of wiring in which two conductors (two halves of a single circuit) are wound together for the purposes of cancelling out electromagnetic interference (EMI) from external sources. Used in copper telephone lines.
<b>Universal Service Obligation</b>	The obligation placed on universal service providers to ensure that standard telephone services, payphones and prescribed carriage services are reasonably accessible to all people in Australia on an equitable basis, wherever they reside or carry on business.
<b>Uploading</b>	The process of copying computer files from your own computer to a computer on the Internet. Examples include sending emails and loading content onto a website.
<b>VDSL</b>	Very high speed or very high bitrate DSL. VDSL is designed to operate over much shorter distances than ADSL, but delivers much higher speeds. Today's leading VDSL chipsets are capable of delivering 100 Mbit/s in each direction, but only over distances of about 300 metres.
<b>Video-conferencing</b>	Involves two or more parties in different locations engaging in communication via video transmission.
<b>Video on Demand</b>	A broadband service where a movie is sent over the network, commencing within a few seconds of the user requesting it. In the most advanced implementations, the user has full 'stream control' (stop, fast forward, fast reverse etc.) – exactly as if they were watching the movie on a DVD player.
<b>VoIP (Voice over Internet Protocol)</b>	VoIP is a technology for providing telephony services over broadband connections, usually at lower cost than traditional voice services.
<b>Web 2.0</b>	A term for the cumulative trend in the design and usage of web sites towards two-way interactive, user-generated content. Examples include blogs, wikis, social networking sites and video sharing sites.

<b>Wholesale Service Provider (WSP)</b>	A provider of infrastructure and services that deals only with other providers and does not have a commercial relationship with end-users or consumers. In telecommunications, a wholesale service provider allows other companies to lease access to equipment and services, and avoid the expense of building their own infrastructure. See Retail Service Providers (RSPs).
<b>Wi-Fi</b>	Wi-Fi is a trademark used to describe certain wireless technology products that support Local Area Networks. Home or office computers are often connected to Internet modems via Wi-Fi instead of an Ethernet cable. As well as many personal computers, Wi-Fi technology is common in an increasing array of devices such as mobile phones, MP3 players, printers and game consoles.
<b>WiMax (Worldwide Interoperability for Microwave Access)</b>	A wireless technology that provides high-speed broadband connections over long distances. It is not a mobile platform; it is specifically designed for optimum broadband performance. It is internationally recognised as a technology that delivers the highest quality wireless broadband.
<b>Wireless Broadband</b>	Wireless broadband uses radio frequencies to transmit and receive data between customers and a local transmission point. Normally, this requires a number of base stations, similar to mobile phone towers, which transmit to customers who have a small transmitter/receiver connected to their computers or other digital devices. Wireless technologies are limited by the availability of wireless spectrum, the number of concurrent users, distance from the cell antenna and physical impediments such as hills and valleys interrupting signals.
<b>Wireless Spectrum</b>	Often referred to as the Radio-Frequency Spectrum, this is the array of electromagnetic radio frequencies used for communications, including mobile broadband, television, AM and FM radio, defence and any other service employing a wireless technology. The spectrum is divided into many frequency ranges, or bands, and usually allocated for a specific technology, device, use or service. Wireless Spectrum is a finite and regulated public asset, and in Australia is administered by the Australian Communications and Media Authority (ACMA), often through a licensing regime.

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<b>World Wide Web (www)</b>	The entire collection of web pages that are distributed across the Internet, which are accessed via a web browser (such as Google Chrome, Microsoft Internet Explorer, or Mozilla Firefox).
<b>xDSL (Digital Subscriber Line)</b>	A generic name encompassing many variants of DSL technology such as ADSL, ADSL 2+ and VDSL.





## Appendix C – Submissions

- 1 Senetas
- 2 Eastern Metropolitan Regional Council
- 3 Cassowary Coast Regional Council
- 4 Port Macquarie-Hastings Council
- 5 The Hills Shire Council
- 6 Gloucester Shire Council
- 7 Canterbury City Council
- 8 City of Victor Harbor
- 9 Regional Development Australia - Whyalla & Eyre Peninsula
- 10 Infrastructure Australia
- 11 Cr Jon Barrell
- 12 Mr Andrew Freeman
- 13 Mr Lidio Bertelli
- 14 East Gippsland Shire Council
- 15 Mr Hugh Dakin
- 16 Eviva Pty Ltd
- 17 Mr Tom Worthington
- 18 Mr Darren Merritt
- 19 Mr Chris Avram
- 20 Ms Kristina Starnawski

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- 21 Mr Ross Hampton
- 22 Far North Queensland Regional Organisation of Councils
- 23 Dr Deb Foskey
- 24 AgForce Queensland
- 25 Mr Vincent Mumford
- 26 Mr Ken Williams
- 27 University of Wollongong
- 28 Mr Mark Freeman
- 29 South West Group
- 30 Ms Jan van Egmond
- 31 McKinlay Shire Council
- 31.1 McKinlay Shire Council (SUPPLEMENTARY)
- 32 Mr Paul Berkman
- 33 Dr F.S. Fisher
- 34 Greater Hume Shire Council
- 35 SAIC Pty Ltd
- 36 Robin & Bernard Terry
- 37 Art when you need it
- 38 Ms Sherry Stumm
- 39 Kiama Municipal Council
- 40 Wheatbelt East Regional Organisations of Councils
- 41 Regional Development Australia Moreton Bay Inc
- 42 Dr Marcus Bowles
- 43 Get Connected
- 44 Tweed Shire Council
- 45 University of Tasmania
- 46 AARNet Pty Ltd
- 47 Mr Peter Friis

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48	La Trobe University
49	Toowoomba Regional Council
50	City of Prospect
51	Destination Tweed Inc
52	Eurobodalla Shire Council
53	National & State Libraries Australasia
54	Narrabri Shire Council
55	Regional Development Australia Northern Rivers NSW
56	Warringah Council
57	Regional Development Australia Central Coast NSW Inc
58	The Royal Australasian College of Physicians
59	North Coast TAFE
60	Australian Institute of Marine Science
61	Deakin University
62	Whitsunday Hinterland and Mackay Bowen Regional Organisation of Councils
63	Ballarat ICT Limited
64	PSMA Australia Limited
65	Screenrights
66	City of Greater Geelong
67	City of Tea Tree Gully
68	Australian Images Photography
69	Goondiwindi Regional Council
70	Redland City Council
71	Gold Coast City Council
72	The Warren Centre for Advanced Engineering Ltd
73	Space Industry Innovation Council
74	Neuroscience Research Australia
75	Australian Medical Association

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- 76 Medical Technology Association of Australia
  - 77 Upper Lachlan Shire Council
  - 78 Coffs Harbour City Council
  - 79 Royal College of Nursing, Australia
  - 80 CAUDIT Inc
  - 81 Penrith City Council
  - 82 Indigenous Remote Communications Association
  - 83 City of Ipswich
  - 84 Institute for a Broadband-Enabled Society
  - 84.1 Institute for a Broadband-Enabled Society (SUPPLEMENTARY)
  - 85 James Cook University
  - 86 Siemens Ltd
  - 87 Rural Health Education Foundation
  - 88 Ms Aishia Trueman
  - 89 Intersect Australia Ltd
  - 90 Regional Development Australia Illawarra
  - 91 Curtin University
  - 91.1 Curtin University (SUPPLEMENTARY)
  - 92 Copyright Agency Limited
  - 93 The University of Newcastle
  - 94 Space Industry Association of Australia
  - 95 Central Local Government Region of South Australia
  - 96 Mr Daniel Bryar
  - 97 Illawarra Business Chamber
  - 98 Hobart City Council
  - 99 Central NSW Councils (Centroc)
  - 100 Moreland City Council
  - 101 Australasian Telehealth Society



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- 102 Association of Professional Engineers, Scientists and Managers, Australia
  - 103 Regional Development Australia Limestone Coast
  - 104 City of Onkaparinga
  - 105 Huawei Technologies
  - 106 National Library of Australia
  - 107 University of Western Sydney
  - 108 Australian Content Industry Group
  - 109 Thales Australia
  - 110 High Country Councils Coalition
  - 111 IT Industry Innovation Council
  - 112 Australian Recording Industry Association
  - 113 Regional Development Australia - Tasmania
  - 114 The University of Sydney
  - 115 Community and Public Service Union
  - 116 Shellharbour City Council
  - 117 NSW Health
  - 118 Logan City Council
  - 119 Australian Federation of Deaf Societies
  - 120 The University of Melbourne
  - 121 Regional Development Australia Yorke and Mid North
  - 122 Southern Cross University
  - 123 Diamond Valley College
  - 124 Australian Information & Communication Technology in Education Committee
  - 125 Society for Knowledge Economics
  - 126 City of Greater Dandenong
  - 127 Regional Development Australia Far West NSW
  - 128 Australian Communications Consumer Action Network

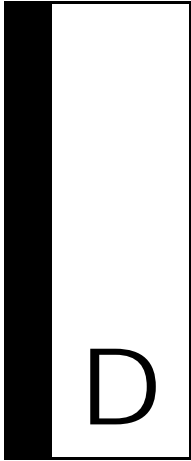
- 
- 129 Copper Development Centre Australia Ltd
- 130 Bass Coast Shire Council
- 131 National Centre for Vocational Education Research
- 132 Mildura Development Corporation
- 133 Regional Development Australia and Regional Development  
Victoria Loddon Mallee
- 134 Smartnet Pty Ltd
- 135 Municipal Association of Victoria
- 136 Australian Publishers Association
- 137 Moreton Bay Regional Council
- 138 Forbes Shire Council
- 139 Australian Local Government Association
- 140 Regional Development Australia Mid North Coast NSW
- 141 Eastern Regional Corridor
- 142 Infonomics Pty Ltd
- 143 National Rural Health Alliance Inc
- 143.1 National Rural Health Alliance Inc (SUPPLEMENTARY)
- 143.2 National Rural Health Alliance Inc (SUPPLEMENTARY)
- 144 Dr Peter Hill
- 145 Remote Area Planning and Development Board
- 146 Australian Computer Society
- 147 City of Geraldton-Greenough
- 148 Music Council of Australia
- 148.1 Music Council of Australia (SUPPLEMENTARY)
- 149 Regional Development Australia - South West
- 150 City of Playford
- 151 Dubbo City Council
- 152 Ms Lucy Craddock
- 153 The University of Queensland

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- 154 Regional Development Australia - Wheatbelt
- 155 CONFIDENTIAL
- 156 Mr Paul Woodhouse
- 157 Mr David Abrahams
- 158 Mr Darko Reljic
- 159 The Hutchins School
- 160 Ms Claire Stock
- 161 Alternative Technology Association
- 162 Museums Australia
- 163 Adult Learning Australia
- 164 Physical Disability Australia Ltd
- 165 City of Mandurah
- 166 Department of Finance and Deregulation
- 167 Goondiwindi Training & Technology
- 168 Council of Australasian Museum Directors
- 169 Department of Regional Australia, Regional Development and  
Local Government
- 169.1 Department of Regional Australia, Regional Development and  
Local Government (SUPPLEMENTARY)
- 170 Special Broadcasting Service
- 171 Commonwealth Scientific and Industrial Research Organisation
- 171.1 Commonwealth Scientific and Industrial Research Organisation  
(SUPPLEMENTARY)
- 172 The Australian Society for Medical Research
- 173 The Tasmanian Electronic Commerce Centre
- 173.1 The Tasmanian Electronic Commerce Centre (SUPPLEMENTARY)
- 174 Swinburne University
- 175 Peel SeniorNet Association
- 176 Australian Telecommunications Users Group

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- 177 University of Technology, Sydney
  - 178 Town of Kwinana
  - 179 Optus
  - 179.1 Optus (SUPPLEMENTARY)
  - 180 RMIT University
  - 181 Brisbane City Council
  - 181.1 Brisbane City Council (SUPPLEMENTARY)
  - 182 NSW Farmers' Association
  - 183 Open Universities Australia
  - 183.1 Open Universities Australia (SUPPLEMENTARY)
  - 184 Australian Information Industry Association
  - 185 Communications Alliance Ltd
  - 186 Department of Human Services
  - 187 Communications, Electrical and Plumbing Union
  - 188 Sunshine Coast Regional Council
  - 189 CA Technologies
  - 190 Department of Resources, Energy and Tourism
  - 190.1 Department of Resources, Energy and Tourism (SUPPLEMENTARY)
  - 191 University of New England
  - 192 Gunning and District Chamber of Commerce Inc
  - 193 Regional Development Australia Barossa Inc
  - 194 Inspire Foundation
  - 195 Government of South Australia
  - 196 Cooperative Research Centres Committee
  - 197 National Farmers' Federation
  - 198 National ICT Australia
  - 199 Townsville City Council
  - 200 University of Technology, Sydney

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- 201 Consumer e-Health Alliance
  - 201.1 Consumer e-Health Alliance (SUPPLEMENTARY)
  - 201.2 Consumer e-Health Alliance (SUPPLEMENTARY)
  - 202 Regional Development Australia Townsville and North West Queensland Inc
  - 203 Innovative Synergies
  - 204 Cairns Regional Council
  - 205 Monash University
  - 206 The Alannah and Madeline Foundation
  - 207 Business Council of Australia
  - 208 Knox City Council
  - 209 Northern Territory Government
  - 210 Leukaemia Foundation
  - 211 Regional Telecommunications Independent Review Committee
  - 212 Department of Health and Ageing
  - 212.1 Department of Health and Ageing (SUPPLEMENTARY)
  - 213 Department of Infrastructure and Transport
  - 214 Department of Immigration and Citizenship
  - 215 Department of Broadband, Communications and the Digital Economy
  - 215.1 Department of Broadband, Communications and the Digital Economy (SUPPLEMENTARY)
  - 216 Australian Library and Information Association
  - 217 Murrindindi Shire Council
  - 218 Regional Development Australia - Far North Queensland and Torres Strait Inc
  - 219 Department of Innovation, Industry, Science and Research
  - 220 Western Downs Regional Council
  - 221 Eastern Regional Libraries Corporation
  - 222 Mr Simon Ow

- 223 Port Stephens Council
- 224 Internode
- 225 Contract I.T. Pty Ltd
- 226 Mr Alun Davies
- 227 ACT Government
- 228 Prof Steven Tingay
- 229 1Spatial Australia Pty Ltd
- 230 Department of Defence
- 231 Nearmap Pty Ltd
- 232 Australia Council for the Arts and Regional Arts Australia
- 233 Google Australia and New Zealand
- 234 The Victorian Government
- 235 National Tourism Alliance



## Appendix D – Exhibits

- 1 Eastern Metropolitan Regional Council  
*Regional Business Case for Broadband Infrastructure Upgrades across Perth's Eastern Region - Executive Summary*  
(Related to Submission No. 2)
  
- 2 City of Victor Harbor  
*Information on fibre optic broadband improvements and plans in Victor Harbor*  
(Related to Submission No. 8)
  
- 3 SAIC Pty Ltd  
*Thoughts on the National Broadband Network Program*  
(Related to Submission No. 35)
  
- 4 Central Local Government Region of South Australia  
*National Broadband Network: Backhaul Blackspots Initiative*  
(Related to Submission No. 95)

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- 5 Huawei Australia  
*Connecting Communities - The impact of broadband on communities in the UK and its implications for Australia*  
(Related to Submission No. 105)
- 6 High Country Councils Coalition  
*High Country Councils Coalition Telecommunications and Broadband Project April 2010*  
(Related to Submission No. 110)
- 7 Southern Cross University  
*The benefits of early adoption for the National Broadband Network spanning Australia's Eastern Regional Corridor*  
(Related to Submission No. 122)
- 8 Society for Knowledge Economics  
*Leading Australia to More Innovative, Productive and Fulfilling Workplaces – The Role of Government*  
(Related to Submission No. 125)
- 9 Infonomics Pty Ltd  
*The Infonomics Letter - July 2010, March 2010, December 2009 and April 2009 Editions*  
(Related to Submission No. 142)
- 10 Australian Telecommunications Users Group (ATUG)  
*ATUG Regional Roadshow on Communications Development*  
(Related to Submission No. 176)



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- 11 Australian Telecommunications Users Group (ATUG)  
*ATUG Forum 2007 - A High Capacity Communications Future for Australia - The Demand View*  
(Related to Submission No. 176)
- 12 Australian Telecommunications Users Group (ATUG)  
*ATUG Future Forums - Developing Australia's Digital Economy - "A Broadband Way of Doing Things"*  
(Related to Submission No. 176)
- 13 Australian Telecommunications Users Group (ATUG)  
*Shift Gear: to a Digital Economy*  
(Related to Submission No. 176)
- 14 Australian Telecommunications Users Group (ATUG)  
*Digital Economy Stakeholders Forums - Issues Summary by Sector*  
(Related to Submission No. 176)
- 15 Australian Information Industry Association  
*AIIA Digital Economy Policy and Regulatory Framework*  
(Related to Submission No. 184)
- 16 Australian Information Industry Association  
*NBN Early Release Sites - Project Ideas for E-Health*  
(Related to Submission No. 184)

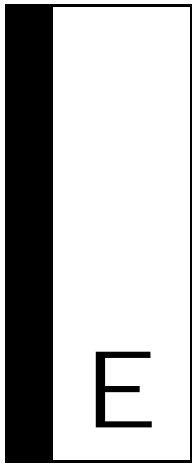
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- 17 Australian Information Industry Association  
*Supporting Comments - House Committee Inquiry into the Potential  
NBN - Enabling Cross-border Cooperative Research and Development*  
(Related to Submission No. 184)
- 18 Australian Information Industry Association  
*Electronic health distributed living lab: NBN enabled systems for ageing  
in place*  
(Related to Submission No. 184)
- 19 The Australian National University  
*Addendum to the ANU evidence*
- 20 Digital Tasmania  
*Tasmanian Collaborative Optical Leading Testbed*
- 21 Ballarat ICT Limited  
*City of Ballarat Economic Strategy 2010-2014*
- 22 Prof Richard Sinnott  
*Melbourne Research - e-Research and the Importance of Broadband*  
(Related to Submission No. 120)
- 23 Institute for a Broadband Enabled Society  
*Annual Report 2010*  
(Related to Submission No. 84)

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- 24      Innovation & Business Skills Australia  
*Impact of the Digital Economy and the National Broadband Network on Skills*  
(Related to Submission No. 187)
- 25      Australian Information & Communication Technology in Education Committee  
*Submission prepared in response to the Department of Broadband Communications and the Digital Economy discussion paper*  
(Related to Submission No. 124)
- 26      Australian Information & Communication Technology in Education Committee  
*Letter from AICTEC to Philip Mason, Assistant Secretary, NBN and Fibre Roll-out Regulation Branch, DBCDE, dated 12 June 2009*  
(Related to Submission No. 124)
- 27      Australian Information & Communication Technology in Education Committee  
*Letter from AICTEC to the Manager, NBN Legislation, DBCDE, dated 30 July 2009*  
(Related to Submission No. 124)
- 28      Australian Information & Communication Technology in Education Committee  
*The VET Sector's E-Portfolio Vision*  
(Related to Submission No. 124)

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- 29 Australian Information & Communication Technology in Education Committee  
*Australian Flexible Learning Framework – supporting e-learning opportunities*  
(Related to Submission No. 124)
- 30 University of Ballarat  
*Ballarat's eHealth Capability*
- 31 City of Prospect  
*Digital Economy Strategy*  
(Related to Submission No. 50)
- 32 Siemens Ltd. Australia  
*Communication Network Solution for Smart Grids*  
(Related to Submission No. 86)
- 33 City of Tea Tree Gully  
*Disability Discrimination Act Access Action Plan 2008-2011*  
(Related to Submission No. 67)
- 34 Institute for a Broadband-Enabled Society  
*Broadband in the Home Pilot Study: Suburban Hobart*  
(Related to Submission No. 84)
- 35 Institute for a Broadband-Enabled Society  
*Assessing the Potential Barriers to the Adoption of High-Speed Broadband by Australian Business Interim Report: April 2011*  
(Related to Submission No. 84)

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- 36 Regional Telecommunications Independent Review Committee  
*Regional Telecommunications Review - Framework for the Future - September 2008*  
(Related to Submission No. 211)
- 37 Australian Computer Society  
*Australian ICT Statistical Compendium 2010*  
(Related to Submission No. 146)
- 38 Australian Computer Society  
*Improving Age Diversity in the ICT Workforce*  
(Related to Submission No. 146)
- 39 Consumer e-Health Alliance  
*A Vision for e-Health*  
(Related to Submission No. 201.1)
- 40 Consumer e-Health Alliance  
*PCEHR - consumer aspirations and issues*  
(Related to Submission No. 201.1)
- 41 Cassowary Coast Regional Council  
*Cassowary Coast Skills Survey*  
(Related to Submission No. 3)
- 42 Get Connected  
*Get Connected Community Internet Survey Report: May 2011*  
(Related to Submission No. 43)





## Appendix E – Public hearings

### Friday, 4 March 2011 – Canberra

#### **Adult Learning Australia**

Ms Sally Thompson, Chief Executive Officer

#### **Australian Council for Private Education and Training**

Mr Paul Lange, Member

Mr Ben Vivekanandan, National Manager, Policy and Research

#### **Australian Information & Communication Technology in Education Committee**

Dr Evan Arthur, Chair

Ms Rhyan Bloor, Member

#### **Australian Medical Association**

Dr Steve Hambleton, Vice President

#### **Commonwealth Scientific and Industrial Research Organisation**

Dr James Moody, Executive Director, Development

Dr Ian Oppermann, Director, CSIRO ICT Centre

#### **Department of Health and Ageing**

Mr Richard Bartlett, First Assistant Secretary, Medicare Benefits Division

Ms Fionna Granger, First Assistant Secretary, eHealth Division

**Department of Innovation, Industry, Science and Research**

Ms Julia Evans, Head of Division, Science and Infrastructure Division

Ms Anne-Marie Lansdown, Head of Division, Science and Infrastructure Division

Mr Mike Lawson, Head of Division, Manufacturing Division

**National Rural Health Alliance Inc**

Mr Gordon Gregory, Executive Director

Ms Helen Hopkins, Policy Advisor

Dr Jennifer May, Chair

Mr Michael Wearne, IT Manager

**Questacon**

Mr Graham Smith, General Manager, Development

**The Australian National University**

Professor Nicholas Glasgow, Dean, Medicine and Health Sciences ANU College of Medicine, Biology and Environment

Professor Kathleen Griffiths, Deputy Director, Centre for Mental Health Research

Professor Robin Stanton, Pro Vice-Chancellor (E-Strategies)

**Thursday, 10 March 2011 - Launceston****Digital Tasmania**

Mr Andrew Connor, Spokesperson

**Dorset Council**

Mrs Ally Mercer, Sustainable Development Manager

**North East Tasmania Chamber of Commerce Inc**

Mrs Suzanne Farnell, Secretary

Mrs Karen Hall, President



**Regional Development Australia - Tasmania Committee**

Mr Craig Perkins, Chief Executive Officer

Mrs Brigid Rawlings, Community & Strategic Development

**Tasmanian Farmers and Graziers Association Inc**

Mrs Melinda King, Policy Research Officer

**Friday, 11 March 2011 - Hobart****Individual**

Professor Patrick Nixon

**Department of Economic Development, Tourism and the Arts, Tasmanian Government**

Mr John McGee, Director, Digital Futures

**TASICT**

Mr Darren Alexander, President

**Tasmanian Chamber of Commerce and Industry Limited**

Mr Robert Wallace, Chief Executive Officer

**Tasmanian Electronic Commerce Centre**

Mr John McCann, Chief Executive Officer

**The Hutchins School**

Dr Jill Abell, Director of Information Technology

**Thursday, 17 March 2011 - Ballarat****Ballarat ICT Limited**

Mr Ian Fry, Executive Officer

**City of Ballarat**

Mr Anthony Schinck, Chief Executive Officer

Mr Jeff Pulford, Director Destination & Connections

**Grampians Rural Health Alliance**

Mr David Ryan, Executive Officer and Chief Information Officer

**Lateral Plains Pty Ltd**

Mr George Fong, Executive Director

**University of Ballarat**

Dr Helen Thompson, Director Centre eCommerce and Communications

**Friday, 18 March 2011 – Melbourne****Australian Federation of Disability Organisation**

Ms Leah Hobson, National Policy Officer

**Communications, Electrical and Plumbing Union**

Mr Burt Blackburne, Divisional Assistant Secretary, Communications Division

Ms Rosalind Eason, Senior National Research Officer, Communications Division

Mr Jim Metcher, Secretary, New South Wales Postal and Telecommunications Branch, Communications Division

**Institute for a Broadband-Enabled Society**

Prof Rod Tucker, Director

Ms Kate Cornick, Executive Director

**Monash University**

Prof Craig Bonnington, Director, Monash e-Research Centre

Prof Adam Shoemaker, Deputy Vice-Chancellor

**Open Universities Australia**

Ms Michelle Beveridge, Executive Director, Operations

Ms Tracey Engwirlda, Project Leader - Educational Technology

Mr Stuart Hamilton, Chief Executive Officer

**Siemens Limited**

Mr Cameron Marcuccio, Picture the Future, Project Manager

Mr Matthew Rait, Picture the Future, Market Analyst

Mr Matthew Sunberg, Picture the Future, Market Analyst

**The Alannah and Madeline Foundation**

Ms Jackie Van Vugt, General Manager, Cybersafety

**Monday, 4 April 2011 - Adelaide****City of Prospect**

Mayor David O'Loughlin, Mayor

Mr Steven Harrison, Director, Business and Economic Development

**City of Tea Tree Gully**

Mr Robert Carmichael, Manager, Business and Economic Development

**Coutts Communications**

Prof Reg Coutts, Managing Director

**Government of South Australia**

Mr Andrew Mills, Chair, South Australian National Broadband Network Taskforce

**Internode**

Mr John Lindsay, General Manager Regulatory and Corporate Affairs

**Rising Sun Pictures**

Mr Tony Clark, Director & Co-Founder

**Tuesday, 5 April 2011 - Victor Harbor****City of Onkaparinga**

Mr Brian Hales, Economic Development Advisor

**City of Victor Harbor**

Mr Daniel Brinkworth, ICT Manager

Mr Graeme Maxwell, City Manager

**Flinders Innovations in Clinical Education**

Mrs Meredith Feist, Manager Operations and Community Engagement

**McLaren Vale Grape, Wine and Tourism Association**

Ms Philippa Forrester, Chair

**Southern Adelaide Economic Development Board**

Mr Allen Bolaffi, Deputy Chair

**Willunga Business and Tourism Association**

Mr Thomas Laing, Secretary

**Monday, 18 April 2011 - Brisbane****AgForce Queensland**

Mr Robert Walker, Chief Executive Officer

**Australian Computer Society**

Mr Adam Redman, Manager, Government Relations and Policy

**Brisbane City Council**

Mr David Jackson, Manager, Economic Development

**Information Technology Industry Innovation Council**

Mr John Grant, Chair

**Leukaemia Foundation**

Dr Anna Williamson, General Manager, Policy and Advocacy

**Regional Telecommunications Independent Review Committee**

Mr Mark Needham, Committee Member

**Smartnet Pty Ltd**

Mr James Kelaher, Director

**Tuesday, 19 April 2011 - Townsville****Cassowary Coast Regional Council**

Mr Shenal Basnayake, Economic Development Officer

**James Cook University**

Professor Ian Atkinson, Director, eResearch Centre

**North Queensland Small Business Development Centre**

Mr Brian Arnold, Chief Executive Officer

Mr Peter Read, IT Consultant

**North Queensland Telecom**

Mr Jeremy Moffat, Managing Director

**On Q Communications**

Mr Mark Frost, Director

**Regional Development Australia Townsville and North West Queensland Inc**

Mr Ron McCullough, Chairperson

Ms Glenys Schunter, Chief Executive Officer

**Townsville City Council**

Mr Douglas Hayward, Senior Economic Development Officer

**Thursday, 28 April 2011 - Wollongong****Consumer e-Health Alliance**

Mr Peter Brown, Convenor

**ICT Illawarra**

Mr Tony De Liseo, President

**Illawarra Business Chamber**

Mr Greg Fisher, Chief Executive Officer

**Kiama Municipal Council**

Mr Chris Quigley, Director, Strategic and Commercial Services

**RDA Illawarra**

Ms Natalie Burroughs, Chief Executive Officer

Mr Geoff McQueen, Board Member

Ms Nicky Sloan, Project Manager

**Shellharbour City Council**

Mr Peter O'Rourke, Director, Community Planning and Strategies

**University of Wollongong**

Professor Don Iverson, Pro Vice-Chancellor, Health

Professor Gerard Sutton, Vice-Chancellor

Mr Chris Grange, Vice-Principle, Administration

Mr Canio Fierravanti, Director, External Relations

**Wollongong City Council**

Mr David Farmer, General Manager

**Friday, 29 April 2011 - Sydney****Australian Telecommunications Users Group**

Mrs Rosemary Sinclair, Managing Director

**Communications Alliance Ltd**

Mr John Stanton, Chief Executive Officer

**Huawei Technologies**

Mr Gary Ballantyne, Account Director - NBN

Mr Jeremy Mitchell, Director of Corporate & Public Affairs

Dr Tim Williams, Consultant

**Intel-GE Care Innovations**

Dr George Margelis, General Manager Australia

**National ICT Australia**

Dr Terence Percival, Director, Broadband & the Digital Economy

Dr Dean Economou, Technology Strategist

Ms Elizabeth Jakubowski, Director, Government Relations

**NBN Co Limited**

Mr Mike Quigley, Chief Executive Officer

**Optus**

Mr Maha Krishnapillai, Director, Government and Corporate Affairs

**Thursday, 5 May 2011 - Perth****Individual**

Ms Valerie Maxville

**Australian Web Industry Association**

Mr Bret Treasure, Member

**Curtin University**

Mr Paul Nicholls, Director, Strategy Projects, Research & Development

**International Centre for Radio Astronomy Research**

Prof Steven Tingay, Deputy Director

**iiNet Ltd**

Mr David Buckingham, Chief Financial Officer

Mr Matthew Dunstan, General Manager Retail

**WA Internet Association**

Mr Richard Bone, President

**Friday, 6 May 2011 - Perth****City of Geraldton-Greenough**

Mr Tony Brun, Chief Executive Officer

**Eastern Metropolitan Regional Council**

Ms Theresa Garvey, Manager, Regional Development

Ms Rhonda Hardy, Director, Regional Services

**Nearmap Pty Ltd**

Mr Adrian Young, Director of Sales

**South West Group**

Mr Chris Fitzhardinge, Director

**Town of Victoria Park**

Mr Anthony Vuleta, Director, Renew Life

**Wheatbelt East Regional Organisations of Councils**

Mr Stephen O'Halloran, Chief Executive Officer

Mr Gregory Powell, Member, Council Representative

Ms Helen Westcott, Executive Officer

**Friday, 27 May 2011 - Canberra**

**AARNet Pty Ltd**

Mr Chris Hancock, Chief Executive Officer

**Australian Information Industry Association**

Mr Ian Birks, Chief Executive Officer

Ms Suzanne Roche, Board Director

**Australian Library and Information Association**

Ms Sue Hutley, Executive Director

Ms Vanessa Little, Director and Vice President, Libraries ACT



**Department of Broadband, Communications and the Digital Economy**

Mr Abul Rizvi, Acting Secretary

Ms Pip Spence, First Assistant Secretary, NBN Implementation Division

Mr Mark Heazlett, Assistant Secretary, NBN Implementation Division

Ms Sylvia Spaseski, Assistant Secretary, Digital Initiatives Branch

Mr Emmanuel Njuguna, Acting Director, Digital Economy Policy & Analysis

**Department of Finance and Deregulation**

Mr Glenn Archer, First Assistant Secretary, Policy and Planning Division

Mr John Edge, First Assistant Secretary, Government Business, Special Claims and Land Policy

**Department of Regional Australia, Regional Development and Local Government**

Mr Simon Atkinson, First Assistant Secretary, Policy and Coordination Division

Ms Kirsty Faichney, Acting Assistant Secretary, Strategic Projects Branch

**Geoscience Australia**

Dr Christopher Pigram, Chief Executive Officer

**Inspire Foundation**

Ms Emma Stace, Deputy Chief Executive Officer

Mr Aram Hosie, Director of Research & Policy

Miss Helen Pepper, Youth Ambassador

**Space Industry Innovation Council**

Mr Brett Biddington, Member

Dr Rosalind Dubs, Chair

**Wednesday, 6 July 2011 - Canberra****Department of Innovation, Industry, Science and Research**

Ms Chris Butler, Head of Division, AusIndustry

Mr Peter Chesworth, Acting Head of Division, Innovation Division

Ms Anne-Marie Lansdown, Head of Division, Science and Infrastructure Division

Mr Mike Lawson, Head of Division, Manufacturing

Mrs Judith Zielke, Head of Division, Enterprise Connect

**Questacon**

Professor Graham Durant, Director