

RURAL TELECOMMUNICATIONS ISSUES

A REPORT TO THE NATIONAL RURAL HEALTH ALLIANCE

BARADEL ECONOMICS



NATIONAL RURAL
HEALTH
ALLIANCE INC.

Disclaimer: The views expressed in this report are those of Jim Groves of Baradel Economics, and not necessarily those of the Alliance, or of any other organisation Jim Groves is associated with. Jim can be contacted at jim@baradeleconomics.com or through the Baradel Economics website at <http://www.baradeleconomics.com>.

EXECUTIVE SUMMARY

This analysis of rural telecommunications issues has been commissioned by the National Rural Health Alliance (NRHA) as part of its ongoing concern to maximise the benefits that telecommunications bring to health services, and life more generally, in rural and remote Australia.

It was occasioned by the publication of the Federal Government's "Vertigan" Report into options for the roll-out of the National Broadcasting Network (NBN). While its main focus was elsewhere, this report cast doubt on the bipartisan commitment to an NBN roll-out in regional, rural and remote areas. The potential consequences are of concern to the NRHA, and to rural and remote Australians more generally.

The paper begins with a summary of the recent Australian Communications and Media Authority (ACMA) report on *Regional Australia in the Digital Economy*, which shows the continued existence of a "digital divide" in Australia which is a legitimate area for policy concern.

The main policy intervention to address this issue is the roll-out of the NBN on the following basis: early roll-out to country towns; fixed wireless and satellite services for the 7% of Australians not able to be serviced by landline; and uniform national wholesale prices. As at the time of the last Federal election, these commitments had bipartisan political support, but all three of these commitments have now come into question as a result of the Vertigan Report.

The main thrust of this paper is a detailed review of the cost-benefit analysis underpinning Vertigan's conclusions. The paper shows that, on alternative and at least equally plausible assumptions, the roll-out of fixed wireless and satellite services to the 7% of Australians not eligible for other NBN services has much less net cost than suggested by the Vertigan Report, to the point where it may have a positive net benefit in its own terms.

Combining this analysis with a critique of other aspects of the Vertigan analysis, it is concluded that all three of the major elements of the NBN roll-out relevant to regional, rural and remote Australians should continue.

A second major focus of the paper is on the major growth area of mobile telecommunications. Some 81% of Australians can access modern data-enabled mobile telecommunications ("3G" and "4G"). There is a case for public policy to promote expanded coverage. The Federal Government's Mobile Black Spot Programme is therefore welcomed. It is suggested however that this should be augmented by a cross-subsidy from existing customers. Some options for how this could be done are presented. It is also suggested that a modified Satellite Phone Subsidy scheme should be re-introduced.

The paper concludes with a brief overview of the consumer safeguards arrangements, including the Universal Service Obligation (USO) and Customer Service Guarantee (CSG). It suggests that these have a continuing role to play, and there should be ongoing pressure to reduce the gaps in customer service standards between urban, rural and remote areas.

The CSG provides minimum performance standards—including the time within which new services

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1 INTRODUCTION

Telecommunications services for rural and remote Australians are back on the policy agenda.

For many years, rural and remote Australians struggled to gain telecommunications parity with those in urban areas. The dynamic nature of telecommunications technologies and markets has meant that rural and remote Australians have never truly been able to catch up.

However, over the years a level of bipartisanship emerged at the political level, with both major political parties taking very similar policies into the 2013 Federal election. These policies centred on a roll-out of the National Broadband Network (NBN) with parity for 93% of Australians, and through the use of wireless and satellite technologies to service the most remote 7% of people. While never promising true parity with urban areas, this represented a very considerable step forward.

Only 12 months later, however, this policy consensus has been challenged by a Report commissioned by the Federal Government into the various options for the NBN roll-out. The Vertigaqn Report, *Independent Cost-Benefit Analysis of the NBN*¹, was commissioned to consider the two major options for the NBN as proposed by the two major political parties going into the last election, viz, a “fibre-to-the-premises” solution, or a less expensive “fibre-to-the-mode” solution.

These two options both include the use of wireless and satellite technologies to service the most remote 7% of Australians. Notwithstanding the main purpose of the Report, its authors chose to conduct a separate cost-benefit analysis of these proposed services to rural and remote Australians. The Report’s conclusion was very negative for rural and remote Australians, who therefore can be considered to be potential “collateral damage” from the overall debate stimulated by the Report.

The health sector needs telecommunications connectivity for continuing professional development, online education, mentoring, clinical decision and other support for the current and next generation of health professionals to go bush – as well as for health service delivery and management. Hence adequacy of telecommunications services has long been an interest of the National Rural Health Alliance.

Consequently, the Alliance commissioned Jim Groves of Baradel Economics to investigate this issue and update his July 2003 paper for the Alliance, *Rural Telecommunications – Current Status*. That report identified improvements in rural telecommunications and remaining deficiencies. It was written in the context of Telstra privatisation, at time when because of the role played by Telstra Australia was a laggard in the adoption of broadband technologies.

It has been said that the past is a foreign country, and nothing could be more true in telecommunications. Telstra has been privatised and, with its incentive to resist broadband removed, Australia has moved forward in the uptake of broadband. Privatisation always should have been accompanied by structural separation of Telstra’s value-added services from its backbone infrastructure and Customer Access Network; this is being achieved via the back door through the creation of the NBN. Some previously hotly debated issues – such as line speeds for dial-up Internet access – are no longer relevant. Other issues have replaced them – notably access to mobile telephone for both voice and data (including “apps”).

¹ http://www.communications.gov.au/broadband/national_broadband_network/cost-benefit_analysis_and_review_of_regulation/independent_cba_of_broadband, accessed 10 October 2014

This paper proceeds as follows. Following this Introduction, section 2 looks at the continuing “digital divide” between urban and rural Australia. Section 3 looks at the broadband roll-out issue, particularly focussing on the conclusions and recommendations of the Vertigan Report. Section 4 reviews developments on the mobile front, while section 5 picks up what it calls “legacy issues”, primarily around voice telephony.

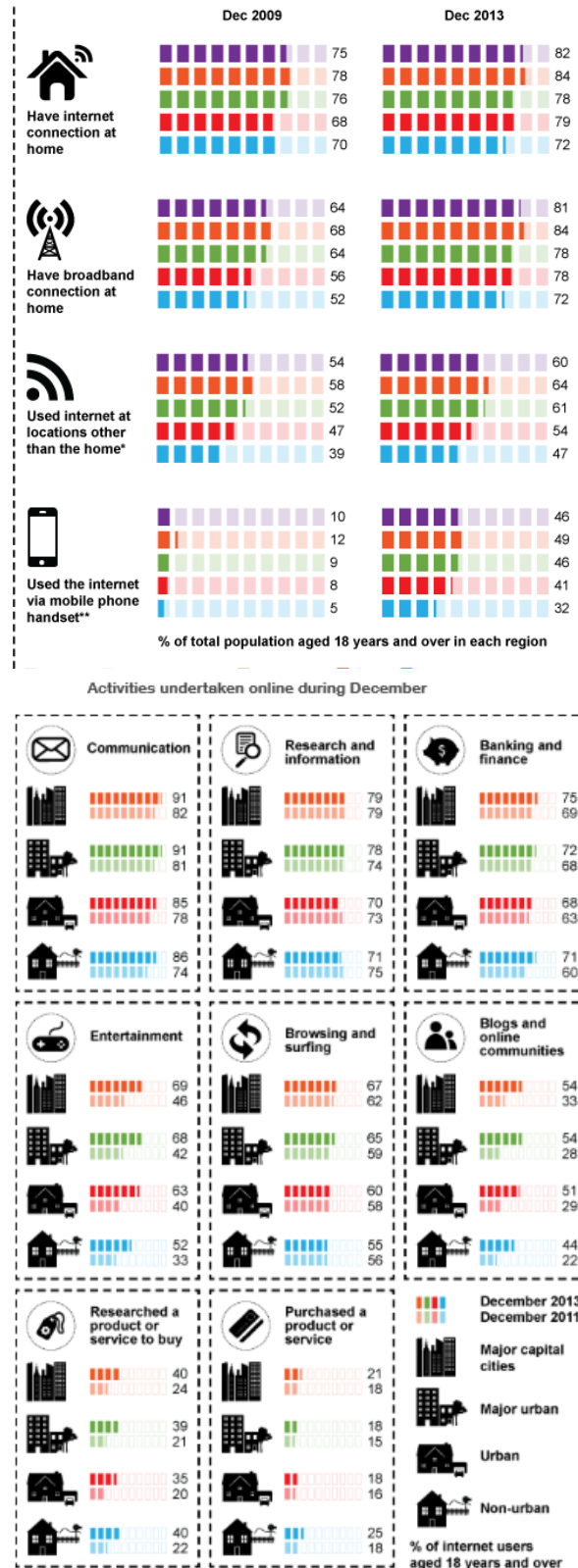
2 IS THERE STILL A DIGITAL DIVIDE?

In August, the Australian Communications and Media Authority (ACMA) released a report on *Regional Australia in the Digital Economy*². As summarised in the following chart from the report, it shows a continuing "digital divide" between urban and rural Australia:

- 72% of non-urban Australians had an Internet connection at home in December 2013, compared with 84% of those in capital cities. This gap widened slightly over the previous four years – from 8 to 12 percentage points
- The same proportions had broadband connections (ie, there is little dial-up Internet access remaining). This gap had narrowed, from 16 to 12 percentage points
- 32% of non-urban Australians used their mobile phone to access the Internet, compared with 49% of those in the capital cities. This was the growth area of Internet access - up from 5% and 12% respectively four years earlier.

Most purposes of Internet use were lower in non-urban areas - eg, 52% of non-urban users accessed for entertainment purposes compared with 69% of those in the capital cities. The exceptions relate to e-commerce - 40% of both groups accessed to research products or services for purchase, and 25% of non-urban users purchased a product or service compared with 21% of capital city residents. Even then, a slightly higher proportion of city dwellers used it for banking or finance (75% compared with 71%). The report doesn't separately identify education or health purposes - the nearest category ("research and information") shows some greater use by capital city residents (79% compared with 71%).

The report also does not distinguish between



² <http://www.acma.gov.au/theACMA/engage-blogs/engage-blogs/Research-snapshots/Regional-Australia-in-the-digital-economy>, accessed 10 October 2014.

urban and non-urban users on the basis of other demographic characteristics. For example, one would expect Internet usage to vary according to occupation and educational status, which might explain some of the differential in favour of urban areas.

In general, this picture implies a continuing digital divide. However, simple comparisons of access levels ignores one important consideration, viz, differences in the potential benefits the Internet may offer to non-urban represents. Given equal access, and correcting for occupational and educational differences, one would expect non-urban residents to get more out of the Internet and hence use it more for certain purposes. This can already be seen in their greater use of e-commerce; that it is not equally apparent in other usages as well as overall access and use suggests the digital divide does continue to exist and hence is a legitimate subject for policy action.

Clearly, a regional telecommunications strategy, or a strategy to overcome Australia's digital divide, would be multi-faceted, encompassing availability and price of telecommunications services, hardware and software, suitable applications, and skills and attitudes of the population. This paper focusses on the first of these – telecommunications services. This is not to say that the other issues are not important; e-health applications, for example, are of particular interest to the National Rural Health Alliance.

3 INTERNET ACCESS AND SPEED

The role and value of the Internet in modern society is taken as a given. Because of its importance, the National Broadband Network (NBN) is the centrepiece of current telecommunications policies.

Both the present and previous Government have adopted the following approaches to NBN roll-out in rural and regional Australia:

- early roll-out of the NBN (be it fibre-to-the-premises under the previous Government, or the current Government mixed-technology approach) to country towns;
- bringing forward the introduction of fixed wireless and satellite services for the 7% of Australians who will not be serviced by the NBN (4% wireless and 3% satellite); and
- uniform national wholesale prices, so that regional communities have the opportunity to get fairer access to affordable high-speed broadband.

Until the publication of the Vertigan Report, these provisions seemed to be settled. However, the Vertigan Report has brought all three of them into question. It has explicitly questioned the proposed roll-out of fixed wireless and satellite services. This is addressed in Section 3.2 below.

3.1 Uniform National Pricing

The Vertigan Report's method included identifying an "unsubsidised roll-out" option against which the NBN options could be evaluated. This "unsubsidised roll-out" option would involve a negation of the principle of uniform national wholesale pricing, and would only roll-out services that would be profitable.

Indeed, the influence of this option can already be seen in the Vertigan Report's recommendation of a gradual move to "cost reflective wholesale pricing", with explicit subsidies provided to "vulnerable consumers". This is a fundamental challenge to the principle of uniform national pricing. While it has some logic in terms of economic efficiency, it ignores a fundamental feature of telecommunications markets, viz, the existence and nature of "network externalities" Network externalities is the benefit that existing users of a network gain from any expansion in the coverage of the network. Network externalities provide a powerful argument for cross-subsidies of the type that occurs under uniform national pricing.

In an ideal world, pricing would not only be "cost reflective", but would also take into account differences in demand conditions across customer groups, differences in social or "spillover" benefits as well as network externalities, and for good measure be structured in a way that would encourage maximum competition and innovation. However, these can be very difficult to estimate and hence such a pricing system can be very difficult to design in practice. There is no reason to believe that moving from one pure model (uniform national pricing) to another ("cost-reflective" pricing), ignoring all these other considerations, would deliver a net improvement in outcomes.

Given these issues, it is likely to be in the long-term interests of rural and remote Australians that uniform national pricing be maintained throughout the NBN rollout period. Some modifications may become appropriate down the track as the NBN benefits are realised and new forms of technologies and competitive opportunities emerge.

Similarly, the Vertigan Report does recommend “structural separation” of NBN along the lines of its underlying networks, where each of the satellite, fixed wireless, HFC and FTTx networks would serve as the basis for a competing entity. This has some attractions on grounds of enabling infrastructure competition – something Australia has not had in the past because of the prevalence of the Telstra monopoly. The problem is that it is difficult to see how this would be consistent with uniform national wholesale pricing, unless an explicit cross-subsidy mechanism was introduced. Clearly any further consideration of this proposal should include developing a workable mechanism for such a cross-subsidy.

3.2 The NBN Solution – Small Country Towns

The bipartisan commitment to the NBN encompasses an estimated 93% of Australians. The timing of the NBN roll-out provided a priority for regional communities balance across areas.

However, the Vertigan Report has implicitly questioned this connection to many small country towns. It suggested that its “unsubsidised roll-out” option would cover between 50 and 93% of the population – its own estimate was 85%. Given that the report has cast doubt on the roll-out of fixed wireless and satellite services to areas not served by fibre, this implies that up to 15% of Australians could be uncovered.

While this option is not recommended by the authors of the Report, its use as a benchmark against which other options could be evaluated – and compared unfavourably – creates pressures for it to be seriously considered and at least some of its elements adopted. Regional Australians need to be seriously concerned about this possibility.

3.3 The NBN Solution – Rural and Remote

The following summary of the technological options is drawn from the Vertigan Report. It shows that the fixed wireless and satellite technologies to be made available to rural and remote areas under the NBN provide line speeds of 25 Mbps³, compared with 100 Mbps actually being provided – and up to 2.5 Gbps potentially available – from the fibre-to-the-premises (FTTP) technology at the heart of the previous Government’s NBN roll-out to the rest of Australia.

This compares with speeds of up to 24 Mbps being provided by non-NBN ADSL2 technologies requiring only a short cabling distance (up to 2 km) over the traditional copper wire network. An estimated 91% of the population have access to ADSL technologies, although only some 28% can access maximum line speeds, withps. some only able to access line speeds around 4 Mb

³ This refers to the NBN long-term satellite solution due to be rolled-out in 2015; the interim solution currently available provides line speeds of around 6 Mbps.

NBN technologies

Technology	Current Performance	Upgradability	Comments
FTTP	NBN Co offers up to 100 Mbps services using GPON with a split ratio of 32:1	Substantial potential by changing electronics at either end. NBN Co could deliver 2.5Gbps services to selected customers today.	High initial deployment costs but low ongoing maintenance costs and low costs to continually upgrade the network over the next 30-50 years.
FTTN	~50 Mbps (for premises 500m from the node and using vectoring)	Without modifying the FTTN network layout, can get up to ~100 Mbps for premises within 100m from the node.	There are limited opportunities to upgrade FTTN that do not involve installing significant additional fibre infrastructure (see Chart C3). Higher operational cost than FTTP over medium to long term.
HFC	100 Mbps ^a	Can be upgraded to speeds of 1 Gbps+ via node splitting (reducing the number of users who share capacity) and upgrading the network and customer premises equipment to newer HFC standards. Trade-off for higher broadband speeds may mean fewer TV channels can be delivered.	A shared medium technology with all users on a particular cable sharing the available bandwidth. For example, if 50 people are sharing a 100 Mbps connection then each will receive around 2 Mbps.
Fixed wireless	25 Mbps	Technologies are constantly improving; speeds of up to 1Gbps theoretically possible with the optimal set up.	Is a shared medium technology with all users on a particular wireless segment sharing the available bandwidth. If congestion is a problem then additional spectrum is required or the installation of additional towers. Available spectrum is limited.
Satellite	25 Mbps	Nil, upgrading capability will involve launching additional satellites.	A last choice technology but has an important role to play in rural and remote Australia where no other options are available.

^a This speed reflects average conditions and assumes the maximum available plan.

Source: Analysys Mason and Tech4i2 2013.

Most current Internet applications are readily available at 25 Mbps or less. This is hardly surprising, as only a small proportion of subscribers worldwide have line speeds above this level. Basic videoconferencing through Skype, for example, requires 0.5 – 1 Mbps; Youtube requires around 1 Mbps. Only high level (“4k”) streaming television requires more than this – around 30 Mbps. It is likely therefore that 25 Mbps will meet most needs of rural and remote Australians for some years to come.

However, this will not always be the case. As higher bandwidth becomes available, new applications will be developed requiring it. More and more “app stacking” will occur. This is where people use multiple applications – often on multiple devices - at once, any one of which might be relatively modest in its bandwidth requirements but all together to add up to a considerable amount.

On the other hand, improving technologies will continue to enable more data to be delivered for a given bandwidth, and improving compression technologies will continue to allow more functionality to be delivered from a given amount of data.

Experience to date is that the balance of these two trends is in the direction of increased bandwidth requirements, reflecting increasing availability and lower cost of bandwidth. It must be assumed that this will continue. In this sense, the FTTP NBN roll-out “future proofs” urban Australia against such an eventuality; the more limited wireless and satellite roll-out to rural and remote areas does not.

Discussions about this issue take the figure that 7% of Australians should be serviced by fixed wireless or satellite services as given. However, many rural and remote communities are within short distance from a fibre cable. Examples might include backbone cables servicing larger communities,

or mining sites and the like which happen to be nearby. Local communities express frustration when they know such fibre cables are there, but their community is unable to connect to them. Where an NBN cable is concerned, the NBN should enable such connection directly. In addition, NBN Co should map other fibre cables and seek to negotiate access solutions on behalf of local communities.

3.4 The “Last Mile”

The NBN is designed to connect individual premises (households and businesses). The current Government’s revised “mixed technology” NBN solution brings fibre to “nodes” and then uses other technologies, notably Telstra’s existing copper wire network, to distribute services to individual premises. This automatically addresses “last mile” issues where this solution is adopted.

However, satellite services, and to a lesser extent fixed wireless services, require the installation of relevant equipment at the customers’ premises. This equipment is not free, and hence it may make sense in some small rural and remote communities for a limited number of services to be installed and a separate network created linking those services to all businesses and households in the community. The existing copper network may not always be adequate for this purpose, or may not be available for some other reason.

NBN service providers should be empowered to address this issue, with support from relevant Government programs such as those supporting additional telecommunications services to remote indigenous communities.

More broadly, a major goal of policy should be to encourage innovation, not only in telecommunications technologies and services but also in the institutional and market environment in which services are delivered. One of the worthwhile recommendations of a recent *Broadband for the Bush* forum in Alice Springs was:

Because of their small scale and often unique characteristics, remote areas often demand tailored telecommunications and broadband solutions, such as for last mile connectivity. An example of this approach would be a local community organisation proposing to aggregate traffic for its constituents for communal broadband access over a single higher capacity service at reduced cost compared to multiple individual satellite services. We recommend the Government establish an innovation budget for development of local infrastructure solutions for remote areas, which will not only assist in achieving the best outcome but may often result in lower cost.⁴

3.5 The Vertigan Report Cost-Benefit Analysis – Rural and Remote

The Vertigan Report calculates that the net present value (NPV) of the proposed satellite and wireless services for rural and remote Australians at minus \$4.2 billion, as shown in the following table from the report. This is the net outcome of costs with an estimated present value of

⁴ http://broadbandforthebush.com.au/wp-content/uploads/2013/05/Broadband_for_the_Bush_Forum_III_COMMUNIQUE_May2014.pdf, accessed 15 October 2014.

\$4.8 billion and benefits with an estimated present value of \$0.6 billion. It is equivalent to a benefit-cost ratio of 0.3⁵ which is usually translated into a statement like “for every dollar spent, only 30 cents is ever returned”.

Costs and benefits	Discounted value (\$b)
Costs	
Capital	3.7
Opex	1.1
Total costs	4.8
Benefits	
WTP	1.2
Public benefits	0.1
DWL of taxation	-1.1
Disruption costs	-0.1
Residual value	0.6
Total benefits	0.6
Net benefits	-4.2
Net benefit per additional customer connected by 2040 (\$)	-6,890

Source: The CIE.

At \$6,890 per additional rural customer, this implies a very significant cost of the rural connections, which some may consider hard to justify. However, even this calculation misrepresents the burden of costs. It is in fact equivalent to some \$520 per Australian household or, spread over 26 years, \$20 per year. As part of a bundle of measures associated with the NBN roll-out, this becomes a much less frightening figure.

However, this calculation should not be taken at face value. A review of the Vertigan Report more generally (see below) has identified a number of issues with the Report’s calculations which, if applied here, may result in a very different picture.

Unfortunately, the Vertigan Report does not present a sensitivity analysis of these results. Such an analysis would assess the sensitivity of these results to variations in the more important parameters, such as demand and the discount rate. No cost-benefit analysis should be treated seriously without such a sensitivity analysis⁶ - certainly, in its absence, no policy conclusions should be drawn.

It is clear however that different assumptions would present a picture much more favourable (or at least much less unfavourable) to the proposed rural and remote roll-out. The following takes each of the issues identified for the Vertigan Report as a whole (see below) and applies them to consideration of the proposed rural and remote roll-out:

- The inclusion of a significant “deadweight loss of taxation” as a cost (or negative benefit) of the proposal is, at best, highly controversial. It is not clear that the NBN will result in any increase in taxation, and even if it does it is not clear that the “deadweight” cost of taxation is anywhere near the level of 24% assumed in the report. This aspect of the Report’s calculations, \$1.1 billion, should be removed.

⁵ Calculated by counting deadweight costs of taxation and disruption costs as costs, not negative benefits as shown in the table.

⁶ Desiderata for cost-benefit analyses more generally are outlined in J Groves, *Economic Evaluation of Research, Development and Extension*, http://www.baradeleconomics.com/files/pdf/Evaluation_webinar_Sept_2014_final.ppt

- The Vertigan Report has come under fire for a conservative forecast of demand growth and, so far at least, its authors have only partly responded. If the calculated benefits are understated by, say, 20% then this would add \$0.2 billion to the value of the project.
- The Vertigan Report completely ignores “network externalities” in its assessment of the value of the proposed NBN and its components. In a telecommunications environment, this is akin to Hamlet without the Prince of Denmark. “Network externalities” are the benefits accruing to existing users of a network from any expansion in the reach of that network to new users. The concept provides a powerful case for cross-subsidies to promote network expansion. A rough estimate of these network externalities can be derived from an application of Metcalfe’s Law, which is that the value of a network increases proportionally to the square of the number of users. Using the figures of the Vertigan Report, it can be estimated that these “network externalities” are worth some \$1.9 billion.
- The Vertigan Report greatly under-states potential “public benefits” from the NBN roll-out. Indeed, the Report’s authors clearly have no understanding of the concept of “spillover” benefits in economic terms. “Spillover” benefits pervade the use of the Internet, both in social (communication) terms and economic (productivity) terms. Even benefits to public service delivery go well beyond minor cost savings to include fundamental issues of access to, and hence the benefits of, services such as health and education. While these benefits are very difficult to estimate - particularly for something as fundamental as a telecommunications revolution - this does not mean they should be ignored. These benefits are likely to be greater for rural and remote residents than for those in urban areas. If these benefits are 30% of private benefits, rather than the 5% assumed in the Report, then this improves the calculation by \$0.3 billion.
- The technical parameters used in the Vertigan Report, such as its time horizon and discount rate, can also be challenged. Certainly a strong case can be made for using a much lower discount rate to compare dollar values of costs and benefits over time than the 8.3% used in the Report. In the absence of a sensitivity analysis, it is unclear what impact this would have on the evaluation of the rural and remote component. The sensitivity analysis showed that this made a significant difference to the overall NBN options; applying this proportionally to the rural and remote roll-out suggests that the Report may be over-stating the net costs of the proposal by some \$0.2 billion on this basis alone.

Taking these together, it would seem that the proposed rural and remote roll-out would not have the negative \$4.2 billion net present value estimated by the Vertigan Report. Instead, its net present value would be around minus \$0.3 billion. Given the uncertainties involved, this is close enough to zero to suggest that it would be inappropriate to conclude that the Government should renege on its commitment to rural Australia on this basis.

Even if there is some cost, the question becomes whether Australians are prepared to pay it – through a cross-subsidy as part of a more general benefit they are getting from the NBN roll-out – to provide some measure of service to the 7% of most isolated Australians. There is unlikely to be little doubt about the answer.

3.6 The Vertigan Report Cost-Benefit Analysis – MTM vs FTTP

So far, this paper has not addressed the overall thrust of the Vertigan Report, which is that the Government's fibre-to-the-node NBN has a much better benefit-cost outcome than the previous Government's fibre-to-the-premises solution. That issue is not directly germane to the concerns of the most remote 7% of Australians who are receiving fixed wireless or satellite services under both options. However, the issue is directly relevant to other Australians in regional areas who, like urban Australians, are to receive a more modest telecommunications service than previously proposed.

Moreover, the Vertigan Report suggests that the fibre-to-the node NBN is not worthwhile if it is bundled with the rural and remote area solution – if that conclusion can be challenged, then the case for bundling the two solutions is strengthened.

Baradel Economics has undertaken a review of the overall Vertigan Report. It is included in the following box. It concludes that, on the basis of different and at least equally realistic parameters to those used in the Vertigan Report:

- the fibre-to-the-node solution would be worthwhile even if bundled with a loss-making rural and remote solution
- the difference between the fibre-to-the-node and fibre-to-the premises NBNs is very much less than presented in the Report, to the point where there is a reasonable likelihood that the fibre-to-the-premises solution (also bundled with the fixed wireless and satellite services for rural and remote areas) would be preferred.

NBN Cost-Benefit Analysis

The following is a review of the cost-benefit analysis on the various options for progressing the National Broadband Network (NBN) from this point released by the Federal Government. It does not address the specifically rural and remote aspects of the study. This analysis suggested that, compared with the scenario of an "unsubsidised rollout":

- the current Government's preferred scenario of "multi-technology mix" (MTM) has a net present value (NPV) of minus \$6.1 billion. This largely reflects the minus \$4.2 billion NPV of servicing rural and remote areas;
- the previous Government's preferred scenario of "fibre to the premises" (FTTP) has a NPV of minus \$22.2 billion.

This is a different summary of the study results than that the "spin" presented in overviews and press reports on the Report. These compared the result of each option with a scenario under which there is no further roll-out of broadband in Australia. In this case, the MTM option has a NPV of plus \$17.9 billion and the FTTP option has a NPV of plus \$1.8 billion. The report would seem to be correct, however, in describing such an option as "unrealistic" and hence not a valid basis for comparison.

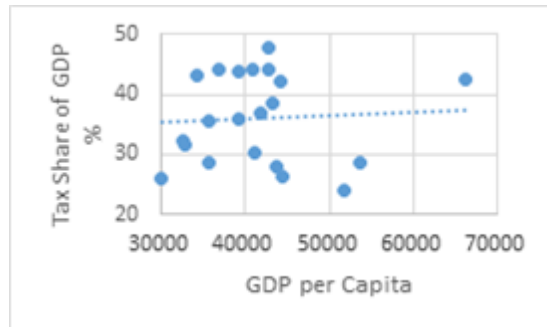
Like any cost-benefit analysis, this study achieves its results by: assembling scenarios, both with and without the project alternatives; assembling the costs; assembling the benefits; and bringing these to a common time frame through the use of a discount rate. The following takes each in turn.

It is unclear that the scenario choice by the study authors is as neat as is presented. The "unsubsidised rollout" option is not a "do nothing" option as significant Government intervention would be required to achieve even that level of broadband rollout. In addition, the construction of the MTM option appears to aim for maximum flexibility, both in terms of technology used and roll-out over time, which may not be fully realisable in practice.

Baradel Economics has not reviewed the detailed cost figures used for each option. It is noted however that the (present value) of the cost of the FTTP option has increased by \$4.7 billion from earlier estimates, whereas the cost of the MTM option has increased by only \$1.0 billion. This reflects different assumptions about productivity growth during the NBN roll-out. While there is scope for legitimate disagreement about such productivity growth, it would be expected that productivity growth would occur as NBN Co gains experience. Hence these higher cost figures may be considered somewhat suspect.

"Costs" are assumed to include a significant "deadweight loss of taxation" of 24%. This is both controversial in concept and in magnitude. For one thing, the NBN is being financed largely off-budget; while this does involve a contingent liability to taxpayers, that is not the same as an actual cost. Moreover, the current Government has a policy of capping tax levels as a proportion of GDP, which means that any Government contribution to the NBN would be at the expense of other expenditures rather than higher taxes.

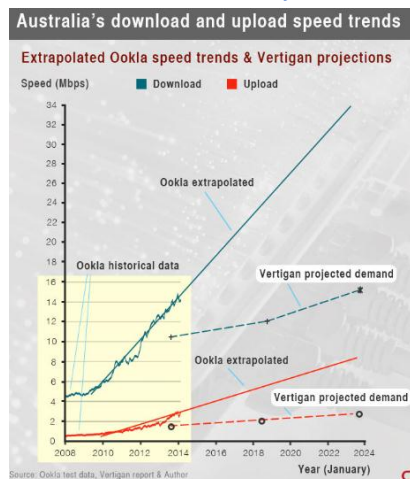
It is true that deadweight costs greater than 24% can be found in the economics literature - as quoted in the study. However, it is still a high figure. All estimates of the deadweight costs of taxation are based on the application of a micro-economic framework to what is in fact a macro-economic context. Looking at the issue from a macro-economic point of view, there is no evidence of a significant negative correlation between tax rates and economic outcomes at all - never mind as much as 24%. The chart below shows that, for the 20 OECD countries with incomes between \$US30,000 and \$US70,000 per capita in 2012, there is little if any correlation between income levels and tax rates - and if anything the correlation is positive. There is certainly no evidence of a 24% "deadweight loss of taxation".



Without the "deadweight loss of taxation", the NPV of the MTM option would improve by \$2.4 billion while the NPV of the FTTP option would improve by \$6.6 billion.

Turning to the benefits estimates, three issues are apparent.

First, the Report rests on a set of demand forecasts that have been challenged by [Rod Tucker of Melbourne University](#). His challenge is demonstrated in this graph of his, which shows that actual demand is already at levels the study has projected for the early 2020s, and on a much stronger growth track than is projected by the authors of the Study.



The author of this part of the Report has responded to Prof Tucker with the claim that their projections are about demand, whereas the Ookla figures in the chart refer to capacity, which are different things. Unfortunately, he provided no information on the extent to which they are different things and how this influences the argument with respect to growth in demand, as distinct from current levels.

It is also unclear how much difference this makes to the overall picture presented in the Report. Prof Tucker makes a linear projection, claiming it is conservative - the true projection is more likely to be the usual technology adoption S-curve, and hence his projections for 2024 are likely to be too high. The sensitivity analysis presented in the Report does not provide a good basis for re-calculating on the basis of revised demand projections. The sensitivity presented shows that on different assumptions the NPVs of the MTM and FTTP options improve by \$0.4b and \$2.4b respectively, but this seems to small an adjustment.

Second, the NBN represents a fundamental change to the nature of the telecommunications market in Australia. Historically, Australian telecommunications have been dominated by the former Government monopoly, Telstra. As it has behaved like a classical monopolist, telecommunication costs have been too high and services have been too low - most obviously the initial roll-out of broadband in Australia was among the slowest in the world, despite our reputation as leaders in the adoption of most other communication technologies. This picture changed in part with competition, but the real change has been through the introduction of infrastructure competition through the NBN. This is changing the fundamental role of Telstra, and introducing a whole new dynamic into the marketplace. The long-run benefits of this are of course very difficult to measure, but are nonetheless real. The FTTP option would seem to make a cleaner break from Telstra's past dominance, and hence may provide greater benefits than the MTM option in this respect. The Report ignores this altogether.

Third, the Report takes an extremely narrow view of the concept of "public" as distinct to "private" benefits. Essentially, the Report's method is to estimate private benefits, and then add a small margin based on estimates of the extent to which the public sector benefits through improved service delivery particularly in education and telehealth. Clearly the authors of the report have no understanding of the concepts of "externalities" or "spillovers". There are spillover benefits to others from a wide variety of broadband applications.

So-called "network externalities" clearly exist - where the value of a network increases more than proportionately to the number of people using the network. "Spillover" benefits pervade the use of the Internet, both in social (communication) terms and economic (productivity) terms. Even benefits to public service delivery go well beyond minor cost savings to include fundamental issues of access to, and hence the benefits of, services such as health and education. Once again, these benefits are very difficult to estimate - particularly for something as fundamental as a telecommunications revolution - but this does not mean they should be ignored.

Purely as an arithmetic exercise, if it is assumed that these benefits represent 20% of private benefits, rather than the 5% assumed in the Report, then the NPV of the MTM and FTTP options would improve by \$6.2b and \$5.8b respectively. Note that the MTM option improves relative to the FTTP option - this reflects its earlier rollout and hence earlier benefits which, in part, reflects the discount rate adopted (see below). However, it is very suspect that the total benefits of the two options would be the same, even allowing for one accruing earlier than the other. This too casts doubt on the conclusions of the Report.

Finally, technical cost-benefit analysis issues. One is the time frame for the analysis. The Report's time frame is to 2040, but a sensitivity analysis shows that if the analysis were extended to 2054, the NPVs of the MTM and FTTP options would improve by \$0.3b and \$0.5b respectively. These changes would be higher at lower discount rates, suggesting that such a longer time frame might make a material difference to the outcome.

The main technical issue with any cost-benefit analysis is the choice of discount rate. This is the economists' holy grail - an enormous literature has developed on this subject, with no consensus as to what the appropriate rate is. The Report uses 8.3% (real) - which is within the range of respectability, but is definitely on the high side. 8.3% is adopted because it is the rate used by NBN Co. However, the Report quite rightly says that NBN Co's financial analysis is not the same as an economic cost-benefit analysis, and adjusts cost estimates accordingly; it is unclear why it does not also adjust the discount rate. A sensitivity analysis looks at rates of 4%, 7% and 10%, as advocated by Infrastructure Australia. There is a strong argument that only 4% is really appropriate and all the others are far too high.

There are two ways to decide the appropriate discount rate - time preference and the social opportunity of capital, with an adjustment for relative risk in each case. Pure time preference is generally considered to be 3% - although it could be argued that 2½ % may be closer. It would be appropriate to make some adjustment for risk - however, how real is the risk in a major infrastructure roll-out? Even including an adjustment for risk, 4% is quite justifiable.

The other method is the social opportunity cost of capital, again with an adjustment for risk. The opportunity cost of capital is currently very close to zero, reflecting the fall-out from the Global Financial Crisis. Given that the GFC is over five years past, it cannot be assumed that this is a short-term phenomenon that will be quickly reversed. As at early October 2014, even the 15-year Australian bond rate is all of 3.73% nominal. Assuming the Reserve Bank will succeed in keeping to its inflation target of 2.5% on average, this is equivalent to 1.2% real. Even 4% would then look quite high, even after adjusting for risk.

On a broader view, one really must question a cost-benefit analysis that includes *both* a very higher discount rate *and* a high deadweight taxation loss. Few public projects would ever pass such a test, raising questions of whether an ideological agenda is at work.

The sensitivity analysis shown in the Report shows that, using a 4% discount rate, improves the NPVs of the MTM and FTTP options by \$2.9b and \$2.8b respectively. The Report argues that lower discount rates increase both the costs and the benefits of the FTTP option compared with the MTM option, resulting in little difference between the two options.

A third technical issue is the treatment of the residual value of the network post-2040 (or post-2054 in the extended scenario). The Report uses a cost-based method which, as it acknowledges, gives a lower figure than the more appropriate, but difficult to estimate, benefit-based method. The Report does not provide a sensitivity analysis of this issue, but if it is assumed the residual value is under-estimated by 20%, then this would add \$0.4 billion and \$0.7 billion to the value of the MTM and FTTP options respectively.

Simply adding up the adjustments able to be quantified above improves the NPVs of the MTM and FTTP options by \$12.6 billion and \$18.8 billion respectively.

On this calculation, the NPV of the MTM option becomes plus \$6.4b - a positive even including the wireless and satellite options for rural and remote areas.

While the NPV of the FTTP option becomes minus \$3.4 billion, this is still a highly conservative calculation – it takes the Vertigan Report's higher cost estimates, it ignores dynamic effects on telecommunications markets, it uses a similar estimate for spillover benefits between the two options, and it ignores the interaction between each of the adjustments, particularly with a lower discount rate. It seems likely that taking all these factors into account, the FTTP option would move to a positive NPV and become competitive with the MTM option.

4 MOBILE VOICE AND DATA

As noted in Section 2 above, mobile telephony is the growth area for Internet access, and for voice and data telecommunications more generally:

- Standard pricing plans for mobile access are rendering the long-standing voice arrangements, such as untimed local calls, redundant
- Prices have been falling to the point where, with bundling and package options available, marginal costs are often zero. Nevertheless, provider profits have been high
- Mobile devices are increasingly used to access the Internet, and other data-intensive “apps”
- As modern “smartphones” can access the Internet through Wi-Fi as well as mobile phone cells, and can conduct voice traffic through apps such as Skype, Internet access in households and business premises can substitute for mobile phone access.

Mobile phone access is therefore increasingly critical for participation in modern society and modern life. Those without reliable mobile coverage are finding it increasingly difficult to fully participate, with adverse social consequences for individuals, and adverse economic consequences for individuals and businesses. ACMA has published a detailed report on *The economic impacts of mobile broadband on the Australian economy, from 2006 to 2013*, which estimates that Australia’s GDP in 2013 was \$33.8 billion greater than it would have been without mobile broadband⁷.

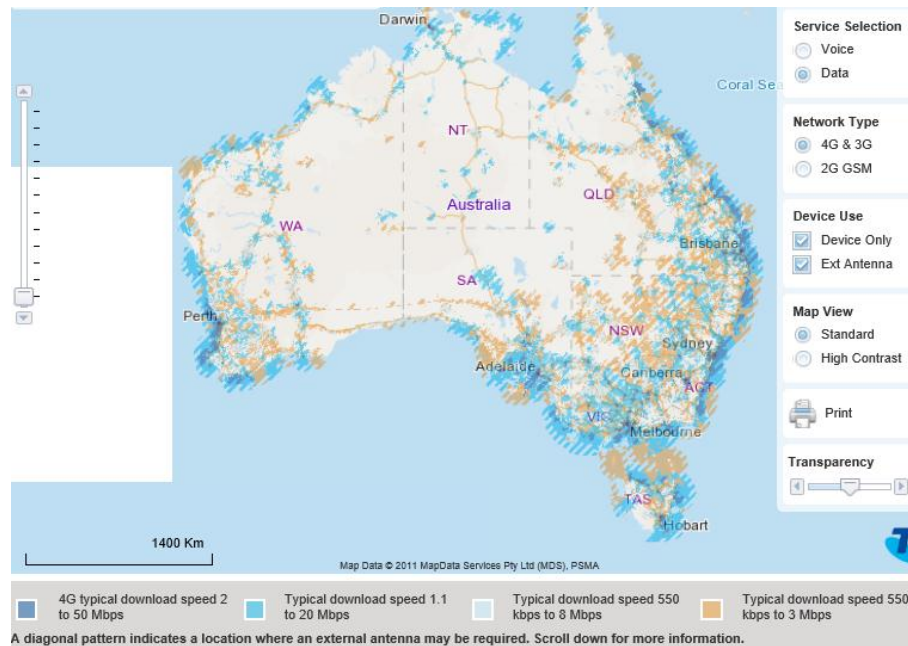
Equally, with the NBN roll-out, this criticality applies only when away from home.

81% of premises have access to 3G mobile broadband services and about 59% have access to 4G services⁸ - Telstra’s coverage map is shown below. Older systems, capable of only voice and limited data traffic, are available to most other Australians. It is claimed therefore that 99% of Australians have some mobile phone coverage. That said, references to population coverage can be misleading:

- Voice calls require access at both destination and receiving locations; 99% of each implies 98% of both.
- People aren’t so much interested in coverage where they live (particularly with household Internet access able to substitute for mobile phone access), but in where they want to make calls from (and to) – farmers in their fields, for example. With only 25% of the landmass covered, true coverage is likely to be significantly lower than 99%.
- As pointed out by the Sinclair Report, coverage figures often include situations where the use of an external antenna is required. This represents an inconvenience, particular to occasional users in those areas, that effectively renders such coverage figures misleading.
- The quality of coverage is also relevant – most people even in urban areas have experienced “black spots” of poor and unreliable coverage.

⁷ <http://www.acma.gov.au/theACMA/Library/researchacma/Research-reports/economic-impacts-of-mobile-broadband-1>, accessed 15 October 2014.

⁸ Department of Communications, *Broadband Availability and Quality Report*, December 2013, http://www.communications.gov.au/data/assets/pdf_file/0018/212535/Broadband_Availability_and_Quality_Report.pdf, accessed 15 October 2014.



3G mobile networks typically offer speeds between 1-20 Mbps downstream; 4G mobile networks typically offer speeds between 2-50 Mbps downstream. However, mobile networks are shared so these speeds vary with the number of users. These speeds are therefore adequate for many current data purposes, but only in limited circumstances are they competitive with the 25 Mbps (downstream) to be made available under the NBN's fixed wireless and satellite options.

The 2011-12 Regional Telecommunications Independent Review noted that, notwithstanding some subsidies for improved coverage in recent years, mobile coverage has been largely left as a commercial matter, unlike the emphasis on fixed voice telephony over the years or, more recently, the NBN roll-out of broadband access to business and household premises. It therefore recommended a:

co-investment program, jointly funded by the Commonwealth and interested states or territory governments, to expand the mobile coverage footprint in regional Australia, focusing on priority regions selected with community input. Open-access arrangements for other carriers to tower infrastructure and/or domestic roaming arrangements should be a feature of the program.

There is a case for public funding for expanding mobile coverage on a number of grounds. These include social benefits of inclusion, productivity benefits for businesses that would have "spillover" benefits going beyond the private benefits to individual firms, and delivery of services such as emergency notification and response.

Accordingly, the Government has committed \$100 million over four years to a Mobile Black Spot Programme. It aims to improve coverage along major transport routes, in small communities and in locations prone to experiencing natural disasters, as well as addressing unique mobile coverage problems. 6,000 locations have been identified as possible candidates for the program; the Government expects to fund 250-300 additional base stations. As well as being publicly available, this list has been provided to mobile phone providers to assist them in preparing funding proposals. An options paper on the delivery of the program was released in December 2013, but the Government has not announced details of how it will deliver this scheme, other than an expectation that a competitive selection process in the second half of this year will lead to announcements of

locations selected for funding in the first half of 2015 and the first base stations funded will begin to roll out in the second half of 2015.

State/Territory Governments, such as the Northern Territory and Western Australia, have indicated a willingness to co-invest in expanded mobile phone coverage. Clearly full advantage should be taken of such opportunities, including in-kind (eg, land) contributions from local communities, and the use of towers and other facilities provided for other purposes.

In addition, there is also a case for a cross-subsidy from existing customers based on “network externalities”. Wider mobile phone coverage not only benefits existing customers by extending the range of localities they can make calls from, it also benefits them by widening the number of people they can contact. As noted in the broadband roll-out context in Section 3 above, Metcalfe’s Law is that the value of a network increases in proportion to the square of the number of people connected to it.

Mobile phone providers have limited incentive to extend coverage to the extent justified by network externalities. This is because, in a competitive environment, there is a significant leakage from one provider’s expanded coverage to other providers. Providers collectively however have an incentive to go much further.

There are a number of options to encourage such expanded coverage funded from cross-subsidies from existing customers, without compromising competition between providers. For example:

- A USO-type arrangement could be implemented, whereby a nominated provider is subsidised by all providers to extend coverage beyond the level that would be justified on commercial grounds alone. The nominated provider could be one of the existing providers, or a new entrant created for that purpose (possibly, though not necessarily, under public ownership), or a combination of each for different areas.
- Mobile phone services are a highly profitable business for existing providers. This suggests that they are able to exercise some market power. This creates a case for public intervention to ensure that these profits are commensurate with the service levels provided, eg, through expanding coverage beyond the level that would be justified on commercial grounds alone.

Even so, not all of Australia is ever going to be covered by cell phone technology, and hence there will be an ongoing need for satellite phone services. The Government has however ceased the Satellite Phone Subsidy Scheme, which provided a subsidy of up to 85%, or \$1000, for the purchase of a satellite phone. In announcing the abolition of the Scheme, the Government pointed to significant declines in satellite phone costs in recent years. This is not an entirely relevant consideration – the scheme’s design automatically adjusted for declining handset costs. Notwithstanding cost declines, satellite phones remain relatively expensive both in terms of handset and call costs. The case for some subsidy remains.

5 LEGACY ISSUES

5.1 Ongoing Reviews of Rural and Regional Telecommunications

Reviews of regional telecommunications were conducted in 2002 (“Estens” Regional Telecommunications Inquiry), 2008 (“Glasson” Regional Telecommunications Independent Review) and 2012 (“Sinclair” Regional Telecommunications Independent Review⁹). It is anticipated that such a review will be conducted every three years, with the next review therefore due to be announced in the near future to be completed in 2015.

These reviews document the progress of regional telecommunications over the years. Much of the following information is based on the 2011-12 Sinclair report, and therefore may not be entirely up-to-date.

The Government has yet to make any announcements re the next review in this series. If the Government remains committed to the wireless and satellite NBN roll-out to rural and remote areas, this should be made clear in the review’s Terms of Reference. The review should also consider whether the actual NBN roll-out is meeting the Government’s objectives with respect to small country towns. Other issues the review should consider include the mobile data issues discussed above and the ongoing consumer safeguard issues discussed below.

5.2 Consumer Safeguards

Consumer safeguards aim to ensure that all Australians have reasonable access to reliable and affordable telephone services. These safeguards include the Universal Service Obligation (USO), Customer Service Guarantee (CSG), Network Reliability Framework (NRF), Priority Assistance, performance monitoring and reporting and a dispute resolution service under the Telecommunications Industry Ombudsman (TIO).

The objective of the USO is to ensure that standard telephone services and payphones are reasonably accessible to all people in Australia. Telstra is the primary universal service provider and is required to fulfil the USO, covering standard telephone services, payphones, and untimed local calls in extended zones.

In the past, the National Rural Health Alliance and other rural groups have sought an upgrade in the definition of the “standard telephone service” to cover dial-up Internet access. Whatever the merits of this at the time, this proposal has clearly been overtaken by market developments, particularly the NBN.

The rollout of the NBN will result in a fundamental change to the structure of the Australian telecommunications market. The NBN will provide an open-access, wholesale-only platform that will enable service providers to provide broadband and other telecommunications services (including voice services) to all premises in Australia.

⁹ 2011–12 Regional Telecommunications Review, *Regional Communications: Empowering Digital Communities*, <http://www.rtirc.gov.au/>, accessed 13 October 2014.

These changes have practical implications for the delivery of basic voice services and other public interest services under the USO. There has been a transition from a regulatory approach to an open and competitive contractual model. For example, retail providers are contracted to ensure a smooth transition to the NBN for voice-only customers. Payments under the USO arrangements in 2012-13 totalled \$253 million for the standard telephone service and \$44 million for payphones.

Telstra is required to maintain its copper network in areas where the NBN fibre will not extend to deliver voice services for 20 years, with a review to occur after 10 years to examine if cost savings can be realised.

As part of the USO, as the primary universal service provider, Telstra must provide payphones that are reasonably accessible on an equitable basis to all people in Australia. This obligation covers the supply, installation and maintenance of public payphones. Similar to fixed-line services, the number of and use of payphones is declining as consumer communication preferences change. Safeguards protecting the USO requirement were introduced in 2012.

The CSG provides minimum performance standards—including the time within which new services must be connected, faults must be rectified, and appointments must be kept. These standards were strengthened in 2012 with the of infringement notice penalties of up to \$990 000 for a failure to meet CSG performance benchmarks. The benchmark is that the CSG time frames must be met or exceeded in 90% of fault repair cases. In 2010-11, most carriers were achieving this in most areas.

What is less well publicised, however, is that the standards themselves are less satisfactory from a customer's point of view in rural and remote areas. For example, fault repair must be by end of next working day in urban areas, but two working days is allowed in rural areas and three in remote areas. These gaps have narrowed over the years, which is appropriate.

The NRF is a compliance and reporting framework that requires Telstra to report to the ACMA on performance of its network and to fix poorly-performing local areas and individual services. Priority assistance is an enhanced telephone connection and repair service for people with a diagnosed life-threatening medical condition. The service provides eligible residential customers with faster connection and fault repair times—24 hours in urban and rural areas, and 48 hours in remote areas.