

Extending remote and rural cellular mobile

A Broadband for the Bush Alliance discussion paper

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Broadband for the Bush Alliance is:

Australian Communications Consumers Action Network, Central Desert Shire Council, Central Land Council, Centre for Appropriate Technology, Centre for Remote Health, Desert Knowledge Australia, Frontier Services, Indigenous Remote Communications Association, Katherine Town Council, Ninti One, Regional Development Australia Northern Territory, Remote Area Planning and Development Board, Swinburne University of Technology

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Preamble

The Broadband for the Bush Alliance (B4BA) supports the expansion of mobile service coverage in remote and rural areas, and from time to time will make specific strategic proposals in relation to Government policy in support of this position. This position is consistent with the strong representations made by the 2012 Regional Telecommunications Review (RTR), which stated that:

“The predominant concern raised with the (RTR) committee is the adequacy of mobile voice and broadband services”, and that “The committee strongly believes that increased priority should be given to expanding the mobile coverage footprint in parts of Regional Australia where it is not commercial to do so”. [Ref. 1]

Remote Australia

In this paper, we are primarily concerned with those sparsely settled parts of Australia that correspond approximately to the outer regional, the remote and very remote areas shown in Figure 1 (The Australian Bureau of Statistics (ABS)), whilst acknowledging that there are also some locations in outer regional areas that are constrained by a lack of cellular mobile coverage. We therefore use ‘remote’ to refer to all of these situations.

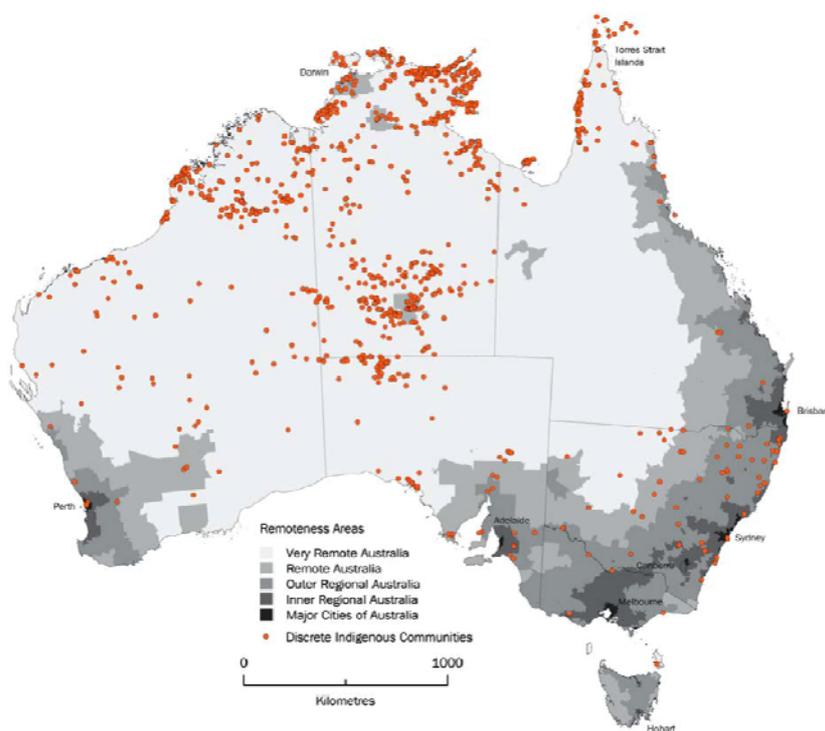


Figure 1: Remoteness areas of Australia

1. Introduction

The high importance and urgency of implementing new initiatives for the extension of cellular mobile coverage in remote Australia has been emphasized by the 2012 ACCAN conference, the 2012 Broadband for the Bush forum and the RTR. A substantial implementation of this type is currently underway in Western Australia through a partnership between the Western Australian Government and Telstra Corporation within that State's Royalties for Regions program (Ref. 2). Very recently, the NT Chief Minister has announced a partnership between the NT Government and Telstra to extend coverage to 8 further remote locations in the Territory (Ref. 3). However, the Federal Government on its part continues to refrain from initiating any significant action of this nature.

A dominant reason for this is that for the last several years, the current Government's policy and philosophical position that it is principally a matter for the market and not for more public money. In addition, and as was pointed out during the B4B forum, the restriction of the NBN Co. charter to essentially fixed broadband services has also served to keep remote-region cellular mobile and its associated backhaul system requirements largely off political agendas.

Although this present Federal Government stance is difficult to argue against other than at a high policy and political level, their response to the RTR advising that (a) mobile carriers could receive access to NBN fixed wireless towers and (b) a review of the effectiveness of that approach will be carried out before committing new funding, does at least suggest some degree of willingness to have regard for the problem (See Government response to Recommendation 3.2 in Ref. 4). The Coalition announced its new policy for broadband and NBN on 9 April 2013 (Ref. 5). With respect to mobile services, in focusing on the potential of the NBN fixed wireless network to contribute to improved mobile coverage and quality, the policy is almost identical to that of the Government. However the Coalition's announcement goes somewhat further than Government policy, in that it explicitly includes the possible contribution of NBN fixed wireless backhaul (in addition to the towers), and also says "The Coalition will seek a report from NBN Co management of any opportunities to leverage the fixed and wireless rollouts to address 'black spots' or extend highway mobile coverage" (p14). In a rather more sweeping statement following the announcement:

"Opposition broadband spokesman Malcolm Turnbull has promised to expand mobile phone coverage in regional areas using NBN Co's infrastructure and guaranteed country residents will be better off under the Coalition's alternative." (AFR 10 April 2013).

Noting that the wording of the Coalition policy does not distinguish between regional and remote communities, nor does it distinguish between infill/blackspot/increased capacity and extended coverage into completely new locations. Given this, there is not a lot of promise in either party's policy for a significant injection of funding to meet the needs of B4BA's constituencies.

Against this background, a central aim of the present discussion paper is to draw attention to certain relevant and important considerations not addressed by the RTR report that stand to substantially strengthen the case for government involvement. The additional considerations are detailed in Section 2 below and suggestions derived from them for an approach to the Government are provided in Section 3.

2. Context - Factors additional to the Regional Telecommunications Review report considerations

Important additional matters omitted from the RTR report include those set out below: -

- Opportunities exist for employing satellite backhaul systems for remote cellular mobile base stations: - They are being employed overseas; e.g. in South Africa, S.E. Asia and South America (Refs. 6-10, 16 & 17) and at a few locations in Australia (Refs. 11-13).
- Recent innovative transmission and operating approaches introduced by the industry are offering large savings making backhaul from locations with small populations feasible. For example fully adaptive capacity-on-demand, local-call-routing, optimized voice & data compression and equipment miniaturization together greatly improve satellite transmission efficiencies and powering. When incorporated with Very Small Aperture Terminal (VSAT) satellite systems, these advanced features can make it practical to efficiently service numerous dispersed variously sized remote communities.
- The latest Ka-Band satellites, such as those to be introduced for Australian remote region NBN services, combine large numbers of multiple spot beams and high bandwidths to achieve greatly increased overall capacities.
- A new company, O3b, has announced plans for a fleet of Medium Earth Orbit (MEO) satellites, with the first four scheduled to be launched in June 2013 and with one main earth station in Perth WA (Ref. 20). As well as providing large broadband capability, these MEO satellites will offer greatly reduced latency for high quality voice services.
- Reports indicate both Telstra and Optus are using satellite backhaul: Telstra for Birdsville, Optus for Birdsville, Kimberley Diamond Company site and in future elsewhere (Refs. –11-13).
- Although the very large transmission capacities offered by optical fibre systems make them best suited for backhaul from large regional centers, terrestrial microwave systems very often prove far more cost effective for feeder backhaul links to smaller townships and communities (Refs. 21, 22). Modern terrestrial microwave systems employ many of the same advanced features used by their satellite counterparts (as referred to above). In combination with miniaturization, the adaptive transmission and powering efficiencies permit transceivers to be physically integrated with the antennas allowing for lower-cost all-tower mounted installations. The equipment integration furthermore enables much of the installation work at remote transceiver sites to be undertaken by staff without specialist telecommunications training.
- There are opportunities for upgrading appropriate parts of the extensive remote region HCRC tower network with modern medium capacity microwave radio systems for terrestrial mobile backhaul. In fact Telstra is reported to have been preparing a similar HCRC upgrading approach in 2009 for 200 HCRC networks servicing 9000 remote residents to sustain its USO commitments (Ref. 18). The proposal was to distribute services at the remote sites via copper or 3G mobile technology, with the latter apparently to be used in fixed mode. Use of the extensive existing HCRC physical infrastructure for this purpose should clearly offer large cost advantages.
- Micro-cell mobile base stations, with costs typically an order of magnitude lower than conventional macro-cell types, are also appropriate for remote locations with low populations. These smaller base station types, which are frequently mounted on relatively short masts or poles, have typical maximum service ranges of around 0.5 km for broadband services and 1.5 to 2 km for voice. Further information see (Refs. 14 - 16).
- In addition to the individual value of satellite or terrestrial microwave backhaul systems in their own right, further benefits can be gained when both can be used via an overall coordinated provisioning approach. Thus while satellite backhaul offers relatively low CapEx start-up costs and rapid provisioning, terrestrial microwave backhaul is recognized to offer lower OpEx costs over the longer term. So as a terrestrial microwave backhaul network grows it can successively take over

the servicing of cellular mobile base stations initially connected via satellite (Refs. –6-8). In this way the satellite ground station facility can either be migrated to new unserved remote regions, or alternatively retained to offer link diversity protection in case of heavy traffic demands or outages.

3. Proposed Approach

Since the potentially important opportunities outlined in the previous section are additional to those addressed by the RTR, they provide material for framing a further approach to the Government. Therefore the aim (for B4BA) is to promote a joint Government / private sector program of the type called for by the RTR, which would specifically include an in-depth feasibility assessment of employing these potential additional opportunities for providing lower cost backhaul and base station equipment for remote area mobile. This objective offers the potential for making the case for extensions to the cellular mobile networks more economically attractive, and thereby to facilitate expansion of the cellular footprint in the bush.

It will never be economically feasible to achieve 100% land area or even 100% population coverage with these technologies. The aim is therefore to continue to make the best use of current technology and accessible existing or new (NBN) infrastructure opportunities to reduce the cost to expand coverage incrementally to the 'next tier' of prospective locations, where conventional commercial business case economics have not justified this step.

The several elements of this assessment are outlined below.

3.1 Backhaul 1: Utilizing satellite for mobile backhaul

Assess the impact of using satellite backhaul for mobile, to take advantage of the window of opportunity expected to be afforded by the launchings of the two new Australian NBN Satellites.

This element of the proposal offers possible cost savings opportunities due to the changing supply/demand scenario for satellite capacity over the next few years.

Discussion

The new multi-beam Ka-band satellites scheduled to take up service in 2015 - 2017 for the NBN Long Term Satellite Service (LSS) will clearly markedly increase Australian broadband satellite communication capacity. Currently available information has all of this additional capacity earmarked for fixed broadband delivery; i.e. in accordance with the NBN Co charter. However until the numbers of NBN fixed customer services approach maturity, spare capacity for other purposes is likely to be available either via the new satellites themselves or through capacity released on existing Ku band satellites as present Interim Satellite Service (ISS) and Australian Broadband Guarantee (ABG) services transfer to the LSS. The Government and the mobile carriers could take advantage of that anticipated window of opportunity by employing some of the increased capacity for mobile backhaul.

3.2 Backhaul 2: Upgrading the capacity of the HCRC network

Assess the impact of introducing modern microwave equipment on parts of the existing remote area HCRC tower network (in parallel with the existing review of the impact of the NBN fixed wireless network in regional areas).

This second element of the proposal is a specific policy opportunity that neither the RTR nor existing Government policy has addressed, and which the mobile carriers themselves have so far not publicly canvassed.

Discussion

The Government's current formal position on regional and remote mobile coverage policy in response to RTR is that it will "review the impact of the NBN fixed wireless network on improving mobile coverage in regional areas before making any commitments to fund a new program to extend mobile coverage" (Government's response to RTR recommendation 3.2). In practice, based on published NBNCo coverage

projections, the impact of the NBN fixed wireless network on remote areas will be negligible.¹ It may have a small impact in regional areas. Unfortunately, the examination of this proposition in isolation is actually likely to delay examination of the larger mobile picture in remote areas.

Nevertheless, the Government's response does amount to a tacit recognition that it may eventually have to consider all of these matters in some depth.

The existing network of Telstra HCRC towers provides comprehensive terrestrial telephone coverage over the outback. It has the following characteristics:

- Continues to provide almost all fixed telephone connections in remote Indigenous communities and remote pastoral stations, including standard telephone services and payphone services delivered under the USO
- Has very low speed (dialup speed) data capacity which is of minimal value
- Uses older microwave technology for backhaul transmission between towers which is not compatible with NBN or mobile use, and would be regarded by Telstra themselves as obsolescent
- The existing HCRC mechanical/electrical infrastructure assets (tower and associated power supply infrastructure - mix of solar pv and other sources) are largely sound, although the electrical capacity would need to be expanded to carry additional loads. The radio path designs undertaken for its development and deployment could be adapted for other microwave technologies. All of the infrastructure is above ground, so maintenance costs would not be exorbitant.
- TUSMA will presumably be paying Telstra to operate and maintain the HCRC network until such time as an alternative more cost effective facility of equivalent performance emerges. One possible scenario is that TUSMA and/or Telstra could encourage existing HCRC USO customers (say by offering financial incentives) to migrate their telephone services onto the NBN satellite service. If this was to occur, such a migration could not begin before the satellites are operational (2015), and we guess it would take until at least 2017 to complete, even with urging from TUSMA and/or Telstra. Therefore the existing HCRC network is likely to remain in place for at least the next four years.
- It is not a strategic commercial asset for Telstra.
- Building on HCRC's specific characteristics, the tower infrastructure could be used to support other microwave borne services. Microwave could be an alternative backhaul option for extended mobile coverage, as modern low cost, medium capacity microwave technology may prove especially cost effective against other options such as terrestrial fibre backhaul and satellite backhaul, when the largely sunk cost of the towers is taken into account. In addition, modern microwave transceivers integrated with the antennas offer cost savings in themselves as they require no ground based equipment buildings and enclosures. Subject to regulatory requirements, such modern microwave equipment could also be used to carry both mobile backhaul and the existing USO telephone backhaul traffic in a multiplex arrangement that preserves the isolation between the two streams of traffic, thus introducing even greater potential for cost efficiency.

Reasons why this has not been pursued before may include:

- The current Federal Government broadband policy focus (i.e. NBN itself) does not encourage its engagement in mobile network extension initiatives, so it may not be interested in raising the prospect of HCRC uses for this purpose
- RTR did not see it in these terms – it did say “it is not clear what arrangements are in place for maintaining or replacing non-copper network assets in the NBN non-fibre footprint, such as HCRC” (finding 2.7), but only in the context of preserving phone services. From this statement

¹ NBNCo state and territory coverage projection maps show that NBN fixed wireless coverage will predominantly be implemented radially around townships in inner and outer regional areas, where mobile coverage already exists. See for example [Queensland Maps](#) and [Northern Territory Maps](#).

clearly Telstra was not forthcoming with information – it did not mention HCRC in its written submission to RTR.

- Telstra may not be interested in promoting further uses for the HCRC towers, as it would inevitably have to make them available to other carriers (particularly Optus).
- Optus sees the issue as too complicated to pursue, since it would have to convince the Government and Telstra to open up the topic for discussion (Optus did not mention HCRC in its submission to RTR)
- The Government might however be amenable to a suggestion that the (NBN wireless tower) review noted above be extended to include “the impact of the existing HCRC tower network on improving mobile coverage in remote areas...”, given that the intent is identical and complementary to that behind the proposal to use NBN wireless towers – the use of committed (or in this case existing) national assets to enhance mobile coverage in areas underserved by the market.

3.3 Coordinating the two approaches

Assess the economic and time benefits of combining the two backhaul approaches

A coordinated approach combining the two backhaul approaches (at different timescales) could take the following course:

In the first instance the ease of installation and fixed capital cost of satellite backhaul equipment, regardless of the distance, would substantially shorten the time many remote communities would have to wait before receiving cellular mobile coverage (Backhaul 1 above).

When the progressively extended terrestrial microwave facilities (based on an upgraded HCRC network) eventually reached a given remote location, the terrestrial link would replace the satellite link and the backhaul operating costs would in most cases significantly reduce, since operating costs for satellite links tend to be appreciably greater than those for most terrestrial microwave systems (Backhaul 2 above).

This coordinated satellite-followed-by-terrestrial-microwave approach would thus deliver a sequence of complementary backhaul solutions, which would potentially encompass many of the outback’s remotest locations. Furthermore, and as explained in Backhaul 1, the existing HCRC physical infrastructure stands to appreciably lower the capital costs.

The generally high income-producing value of cellular mobile services to the Network Operator, and the flexibility afforded by more recent innovations such as micro-cells, makes it possible that relatively modest incentives, say in the form of somewhat reduced NBN satellite backhaul charges, would be sufficient to attract Operator involvement for servicing many remote localities with mobile coverage. Insofar as the satellite segment is concerned, it is possible the Government (of either persuasion) would stand to obtain a net windfall return, even when charging reduced rates for leasing out otherwise unused capacity for mobile backhaul when the new NBN satellites are launched.

Such an initiative would ensure the issue was taken up by appropriate industry bodies as a matter of course. In particular, it would cause satellite backhaul for cellular mobile to be considered in a timely manner by the Communications Alliance (CA) Satellite Services Working Group (SSWG) which was set up last year.² Examination by this major influential industry body would offer the best insurance that issues

² Currently the issues being addressed by the SSWG include:

1. Advocacy on behalf of the satellite sector, including via input to State and Federal Government policy development and Inquiries, and through representation of satellite sector interests on the ACMA’s Radiocommunications Consultative Committee (RCC)
2. Participation on the ACMA Australian Radiocommunications Study Group 4, Satellite services (ARSG 4)
3. Contributing to the ACMA spectrum management planning work program, including their Five-year Spectrum Outlook 2012-2016
4. General promotion of the role and importance of satellite services for Australia through the Satellite Industry Promotion Campaign
5. Liaison with NBN Co on operational and commercial issues relating to the satellite-based components of the National Broadband Network
6. Expert input into the creation or revision of Communications Alliance Codes, Guidelines and Standards that have implications for satellite-based services
7. Collaborative activities to foster the development and growth of the satellite sector in Australia and to resolve technical or commercial issues of common interest

specific to cellular mobile backhaul are taken into account during the present pre-launch design and construction phase of the new Australian Satellites.

3.4 Lower cost base station equipment

Assess the additional costs savings associated with introducing low cost base station equipment in (new) remote locations

Micro-cell mobile base stations, with costs typically an order of magnitude lower than conventional macro-cell types, are also appropriate for remote locations with low populations. These relatively inexpensive installation types are being used for appreciable numbers of infill deployments in our cities and large regional centres (Refs 14, 15). However they would also be well suited for many small remote communities, remote station homesteads, small remote mining sites and remote highway roadhouses and tourist resorts. Overseas reports suggest that when connected via satellite or terrestrial microwave backhaul (or a hybrid of the two), micro-cell base stations or the even smaller femto-cell types can now economically provide cellular mobile services to many small remote locations previously considered to have insufficient numbers of potential users.(Refs. 6, 16 & 17)

With regard to their relevance to satellite systems:

“Economic modeling carried out by Informa shows that, when used in conjunction with small cells, the business case for satellite backhaul is strongly favorable. Payback can be achieved in as little as two years, and total cost of ownership (TCO) is highly competitive due to significantly reduced capex relative to competing solutions, and opex in line with similar network deployments.” (Ref. 16 –p4)

While this evidence based on UK rural modeling may not translate directly to the Australian remote/rural situation, the feasibility assessment proposed by B4BA should take such evidence into account.

4. Broadband for the Bush Alliance Position

The substantive financial data required to undertake the assessments outlined above is not in the public domain. Satellite backhaul costs and potentially available (i.e. spare) capacities are known in part to NBNCo, and in part to other commercial satellite providers. The status and distribution of HCRC towers and their potential for backhauling mobile traffic (and possibly also carrying base station transceivers) for possible ‘next tier’ remote towns, communities and highway locations is known to Telstra Corporation, who manage them. The detailed costs associated with current generation micro-cell mobile base stations are known to the primary mobile network operators (Telstra, Optus and Vodafone).

The object for B4BA is therefore to promote a detailed assessment by all of the above parties, coordinated by the government of the day. The Federal Government has already agreed to a review of the potential of using the NBN wireless towers for a similar purpose, and Coalition policy is very similar (see Section 1) though our proposal is more wide ranging and would have much greater prospect of assisting in remote areas.

Support for an initiative of this type comes from the 4th report of the Joint Parliamentary Committee on the NBN, reviewing rollout progress, which recommended (26/2/2013):

“Recommendation 4

The committee recommends that the Government support the NBN Co to continue to:

explore the synergies between fixed and mobile telecommunications networks with a view to using the National Broadband Network to improve mobile telecommunications; and

facilitate private providers use of NBN Co infrastructure to provide and improve mobile telephone services and coverage across Australia, particularly in regional and remote areas.”

In fact the committee went as far as to note:

8. Monitoring of international standards work relevant to the Australian satellite sector.

“The committee is also interested in the future development of mobile backhaul, with its potential to create a higher level of integration of Australia’s telecommunications systems”.

(Ref 19)

We also point out that some of the elements to be assessed may well prove to be more viable than others, and while coordination between the viable ones is very desirable, each one will stand on its merits.

5. Broadband for the Bush Alliance Recommendation

That in accordance with Rec. 3.2 of the 2011/12 RTR, the Federal Government of the day initiate a jointly funded program to expand the coverage of cellular mobile services into regional and remote areas with high priority. That the program should furthermore specifically commence with an in-depth feasibility assessment to account for all potential options for achieving the required expansion in the most cost-effective manner.

The assessment should involve all relevant parties including network operators, service providers and their representative industry association (Communications Alliance), NBN Co, state and territory Governments, and representatives of regional and remote area end-users.

In particular, the assessment should include consideration of both the short- and long-term opportunities presented by such factors as:

- Shared use of NBN infrastructure;
- Available satellite backhaul capacity;
- Shared use of HCRC and other tower infrastructure;
- Use of lower capacity/ cost microwave and base station technologies;
- And, the benefits to be gained by coordinating these approaches.

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