

**Addendum Response to the
Select Senate Committee on the
National Broadband Network**

By

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Senator Ian MacDonald – Birdsville Broadband

Senator Nick Minchin – Infrastructure Regime

Senator Nick Minchin – Staff and Training

Deutsche Bank Australia – CAN Copper in Ducting

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Senator Ian MacDonald – Birdsville Broadband

In my initial response at the Select Senate Hearing on the 20th July 2009 about connecting Broadband to Birdsville, I suggested that a mix of optical fibre and radio would be connected from Longreach as the nearest position to Birdsville, and I was guessing on the position of Longreach in Central Queensland as the nearest regional centre to Birdsville.

Having checked my Gregory's Map 149 "Australia", it became obvious to me that there would be a communication link along the road from Charleville using point-to-point radio as a main bearer going west via Quilpie, Galway Downs, Betoota to Birdsville and this probably is based on 2.4 GHz and probably runs a 34 MB/s PDH link. I am also guessing that this equipment is possibly running near full capacity for voice traffic (0.064 Mb/s per voice channel or a total system availability of less than 500 voice channels, or directionally 250 voice channels each way), shared between more than 33 communities.

As Broadband has a substantially larger bandwidth requirement (say 750 Mb/s per 1000 customers in a wholesale sense) then this link would be running in total network congestion if Broadband were to be offered to Birdsville from Charleville, because the available backhaul network bandwidth simply would not be there, as it would be a "tiered star" from Charleville, with many wayside stations on the route and this is probably a good reason why Birdsville may not have high capacity Broadband capability in the immediate future.

In light of that probable network congestion issue west of Charleville towards Birdsville, I would reconsider the option of upgrading the existing optical fibre spur off Longreach (as I had suggested to you in the Select Senate Hearing). As far as I know, currently there is no backhaul connection directly between Longreach and Birdsville, but I believe that there would be an optical fibre from Longreach to Stonehenge, and possibly on to Jundah (as there is a good road there). Jundah is not all that far from Galway Downs (probably about 60 km (or about 107 km from Stonehenge) as the crow flies, depending on where the current optical fibre ends).

It would make very good engineering sense to me to extend the optical fibre from Stonehenge / Jundah through to Galway Downs, and replace the associated existing transmission equipment (probably 150 MB/s SDH) with a much higher capacity for example say 1 Gb/s (1,000 Mb/s) so that the link from Longreach to Galway Downs (and its wayside stations of about 15 communities) would be able to share the backhaul 1 Gb/s capacity, for without getting anywhere near network congestion for intense Broadband Internet uses.

If this optical fibre system was then to cross connect at Galway Downs with the existing 34 Mb/s radio system between Charleville and Birdsville, then this much higher capacity (1 Gb/s) optical link will provide geographic network diversity for the Birdsville link via Galway Downs to both Longreach and Charleville, so that it could be dual parented (which means greatly increased network reliability for the customers).

The extended and upgraded (1 Gb/s) optical fibre link will radically change the backhaul network structure and (as I had originally alluded to in my response), the extended higher capacity optical fibre link with a much shortened tiered star structure will provide a much high network bandwidth per connection, so that Birdsville could have high bandwidth Broadband, with a comparatively small outlay (*commercially, in a competitive regime frame of reference, this infrastructure expenditure would never be financially justified*).

The nominal 34 MB/s radio link from Birdsville to Galway Downs (back towards Charleville) would, in my opinion, be too a low capacity for Broadband, and a rethink here to upgrade this

link from nominally 2.4 GHz to a nominally 5.7 GHz system that has a maximum throughput of about 60 Mb/s which is a substantial increase on 34 MB/s. By translating the telephony voice to VOIP at the terminal exchanges, there are substantial bandwidth savings that make Broadband Internet at shared say 40 Mb/s for say 720 locations considerably faster than dial-up Internet over dedicated telephony channels (that would probably be in continual network congestion because dial-up Internet connections are usually on for about 25 minutes where voice telephony is usually just under 3 minutes).

Because of the bursty nature of Internet, Broadband end user speeds could peak over 12 Mb/s, and average about 4 Mb/s, which is considerably faster than say 0.056 Mb/s in optimal dial-up Internet. This is assuming that the physical pair cable CAN between exchange sites and premises is less than nominally 1.5 km and ADSL 2+ would be used (at this stage).

The backhaul 34 Mb/s radio system from Galway Downs could also be reconfigured so that some of the locations towards Charleville (for example Tenham and Thylungra) could be primarily parented towards Longreach via the 1 Gb/s optical fibre tail and this would give them very good Broadband backhaul availability (if their pair cable CAN is short enough).

From the Charleville end, the extended optical fibre from Longreach to Galway Downs will dramatically increase their opportunities for Broadband use, as the number of wayside communities towards Birdsville from Charleville is dropped from say 35, to about 8 back to Charleville on the 34 Mb/s radio system, where the rest would go to Longreach via Galway Downs on the 1000 Mb/s optical system.

The missing high capacity backhaul link that I proposed in my submission to the Expert Committee and referred to in this Select Senate Hearing would be the high capacity highway to connect these inland communities into the broader high capacity backhaul infrastructure *via Darwin . . . Longreach, Blackall, Charleville, Cunnamulla, Bourke . . . Griffith . . . Broken Hill . . Port Lincoln*. And this backhaul Backbone will then be the inland frame to link the optical fibre grid towards the higher density populated east/south coastal areas, as I outlined in the third page of the supplementary graphics document depicting in light blue a nominal inland grid of high capacity optical fibre.

Here is a quick ball-park questimate of the proposed system:

Optical Fibre Longreach – Galway Downs

| | |
|-----------------------------------------------------------------|--------------------|
| Engineering evaluation with a walk through and detailed designs | \$50,000 |
| 107 km of Optical Fibre at \$30,000/km | \$3,210,000 |
| 5 *1 Gb/s Routers at \$20,000 | \$100,000 |
| 4 * Power Packs and Batteries at \$10,000 | \$40,000 |
| Install and Commission Network Equipment | \$15,000 |
| Sub total | \$3,415,000 |

Radio Galway Downs – Birdsville

| | |
|-----------------------------------------------------------------|------------------|
| Engineering evaluation with a walk through and detailed designs | \$50,000 |
| 3 Routers and ancillary equipment \$20,000 | \$60,000 |
| 8 *5.7 GHZ point-point radio systems \$20,000 | \$160,000 |
| 8 * Power Packs and Batteries at \$10,000 | \$80,000 |
| Install and Commission Network Equipment | \$65,000 |
| Sub total | \$415,000 |

My first guess for the total backhaul work is in the order of \$3.9 M, but this is only half the solution as it is not any use having backhaul that cannot connect with the CAN, especially when that backhaul goes through / over these customers properties!

Assuming that these locations do not have ADSL, but do now have the capability for Broadband, with a broad-brush approach, wire all physicals (direct pair copper) through mini-DSLAMS and connect the DSLAM backhaul side to the upgraded backhaul via the routers positioned as regenerators / amplifiers:

Install DSLAMs at regenerator sites to all physical CAN circuits Birdsville – Longreach / Charleville (west sides)

| | |
|-----------------------------------------------------------------|--------------------|
| Engineering evaluation with a walk through and detailed designs | \$70,000 |
| 15 * 48 Channel DSLAMS ancillary equipment \$50,000 | \$720,000 |
| 15 * Power Packs and Batteries at \$10,000 | \$150,000 |
| Install and Commission Network | \$144,000 |
| Sub total | \$1,084,000 |

So this would connect about 720 premises with Broadband using ADSL for a very rough guess totalling about \$4.9 M (or about say \$6,800 per premises). The fact is the take-up will really be about 70% because the first guess will not align with the premises so the more real cost is towards \$10,000 per premises. And this CAN needs to connect with solid backhaul:

In one of the Superman movies there is classic scene, when Superman swooped down so save Lois as she was falling from a helicopter to her certain death. Superman caught her and they stopped in mid-air, and as he held her in his arms, he said, "It's alright Lois, I've got you!" to which a very surprised Lois responded to Superman, "But who's got you?"

This classic scene encases the associated problem by connecting Longreach with an extended 1 Gb/s high capacity optical fibre link to Galway Downs, so that Birdsville can have Broadband. We may have solved the problem of getting a good backhaul network infrastructure from Birdsville to Longreach, but there is not enough backhaul network capacity to connect Longreach with the rest of the major backhaul which is in this case located along the eastern continental border. So the link from Longreach to Emerald would need to be upgraded, and probably the Emerald – Rockhampton link too! Hence my reasoning for the inland high capacity backhaul link in the first case...

I hope that this extended answer to your very difficult question about connecting Birdsville onto Broadband gives you and other Senators an insight into how one piece of well considered backhaul infrastructure with engineering know-how can positively affect the performance of more than 50 remote communities. In this case these communities are more than 600 km apart and covering an area of about 162,500 square km, without resorting to very expensive continued foreign debit by utilising satellites in a first instance.

Senator Nick Minchin – Infrastructure Regime

When I responded to your questions on competitive businesses, I did not have a concrete example that clearly showed why and how the competitive regime (competing businesses) is the wrong frame of reference to use with infrastructure, as the “Second Best” scenario always results. In this case there is the need for the \$43 Bn NBN to correct the severe underspend in non-metro telecomms infrastructure that started in about 1983 after the Davidson Report (1982) initiated the ‘commercialisation’ of the telecomms infrastructure. Even then, that report got it wrong by instigating the universal services obligation (USO), which this year was about \$145 M to make the non-metro areas look as though they are commercially viable.

During the Howard Government tenure there was the NTN fiasco, the DAB rollout, the HiBIS and a few other programs to inject telecomms funding on a commercial basis – when clearly this should have been on an infrastructure basis (and this is why they failed). As it turned out, the extended answer (above) that I provided to Senator Ian MacDonald is a classical case that shows the ballpark funding, as a concrete reference to use to show how external accounting P&L with infrastructures operates to the benefit of Australia’s economy.

In the above extension of the answer provided to Senator Ian MacDonald, if the competitive regime frame of reference is used, then there is no way that this infrastructure would be installed as the internal P&L statements would show that the customers would never pay enough for the services at levelled commercial rates, and Telstra (in this case) would never amortise these costs and make enough profits over a short enough time frame to satisfy their ‘competitive’ business model.

The internal P&L accounting used with the competitive regime runs along the internal lines of “the retail users will pay a lot more than the whole infrastructure costs, and over a specified time frame of say three years, and the rest is almost straight profit, minus overheads.”

If Telstra did put in this infrastructure, then they would have to answer to their shareholders, who would not be at all pleased because this funding would not be giving a financial return.

With the above scenario, the wholesale outlay will be in the order of \$10,000 per premises, so if this was spread over three years then this is a monthly bill of about \$277, before interest is considered, so the wholesale bill will be in the order of \$300 per month, per premises.

The retail rate will be approximately 100% over the wholesale’s unit rate, so this will be about \$600 per month per premises, and considering that the going retail ADSL rate is nominally say \$60 per month, the Birdsville case is simply not justifiable by internal accounting methods, as it is in the order of 10 times more expensive than the nominal rate.

What may not be obvious is that since about 1990, Telecom Australia / Telstra changed its accounting methods to use internal P&L accounting to match the needs of its shareholders, and maximise its profits. Consequently almost all new infrastructure from that date has gone onto telecomms facilities is equipment that has a high usage rate and a low per-premises cost, and that basically meant that Band 1 and Band 2 (major capital cities, their suburbs and major non-capital cities). The rest of Australia has basically missed out.

Taking the above case (Birdsville Broadband) that was raised by Senator Ian MacDonald. Assuming that this infrastructure cost came out as \$10,000 per premises, then the external accounting P&L process would move in and look at many issues like:

| | |
|-------------------------------------------------------------|-----------------|
| Medical eHealth savings through customers using BB Internet | \$500 |
| Unemployment social service cost reductions | \$2,000 |
| Saving in Petrol and Oil products | \$3,650 |
| Improved Education | \$5,000 |
| Trading from the Farm | \$3,000 |
| Short List Sub-total (per premises, per year) | \$14,150 |

So using the External Accounting P&L approach as used in the infrastructure regime, this infrastructure would have paid for itself in less than 9 months, and we have not even asked the shareholders about the profits (because the government and opposition are the shareholders), and the government overheads on Social Security and Health / Medical are significantly dropped, while these people will be paying bigger taxes!

The obvious argument is that these external accounting P&L figures are far too optimistic, so if these figures were heavily discounted by say 75% then we will get:

| | |
|-------------------------------------------------------------|----------------|
| Medical eHealth savings through customers using BB Internet | \$125 |
| Unemployment social service cost reductions | \$500 |
| Saving in Petrol and Oil products | \$912 |
| Improved Education | \$1,250 |
| Trading from the Farm | \$750 |
| Short List Sub-total (per premises, per year) | \$3,537 |

Keeping this external P&L accounting in line with a typical competitive business case, then it should break even over three years (neglecting interest). These heavily discounted figures clearly show that the payback to the government for putting in this infrastructure is more than \$10,500 over three years making this infrastructure business case extremely compelling.

Typically the Australian telecomms spend (investment) on infrastructure would be in the order of \$5 Bn per year, but if you go back to about 1990 and rationalise the telecomms investment by about 50% due to the competitive regime kicking in, (including considerable ACCC based costs for thousands of lawyers in Telstra) so the infrastructure investment is about say \$2.0 Bn per year, then the underspend thanks to the competitive regime is about 19 * \$2.0 Bn = \$38 Bn, and looking backwards this is a bit under what the NBN is (\$43 Bn)!

When I described the outline of the economic *“Theory of the Second Best”*, in the Selective Senate Hearing it should have been very obvious that *the competitive regime is clearly the “Second Best” strategy for the Australian economy* – but we are naturally competitive, and the least disruptive placement for the competitive regime is in retail reselling. We have several very successful competitive businesses like David Jones, Myer, Woolworths, Coles, Harvey Norman, Bunnings to name a few; and all of these have focussed customer markets, with a minimum of infrastructure, and a minimum of involvement with the ACCC. Telstra as it is, has a maximum of infrastructure and a maximum of interaction with the ACCC!

If we really want the “First Best” for Australia, then it is a ‘no-brainer’ to utilise the infrastructure regime for telecomms infrastructure at a wholesale level (ie NBN and Telstra Infrastructure Wholesale working as one) and let the competitive regime retail this wholesale infrastructure products and services to the public, just like other major successful retail trading businesses in Australia.

So here is the problem: *We now know that by using the competitive regime’s approach of utilising internal P&L statements to prioritise infrastructure on a biggest returns basis, this*

maximises infrastructure in the “metro” cities and minimises infrastructure everywhere elsewhere.

We know that the NBN is being set up (as a company) funded by the government as an infrastructure regime business to put in infrastructure everywhere so that areas that have missed out in the last 20 or so years can be provided with Broadband Internet (and both sides of Government and Opposition have a general agreement with this strategy)!

Why would the Government and Opposition be so inept to put the NBN back into the competitive regime after any time frame at all, when they have the historical facts that prove this situation ends up with a “Second Best” economic situation for Australia?

Senator Nick Minchin – Staff and Training

The evidence that I presented in response to your questioning about staff ages was rather incomplete, so this short addendum addresses most of the areas that I did not cover.

Before I left Telstra in 1996 there was a concerted effort to bring in a younger work force particularly in the sales and marketing areas. In general I commended this competitive business approach as the shopfronts usually have younger clientele and this maximises their business profitability, and seniors are usually not high-revenue clientele.

In regards to the technical / field staff in the telecomms industry; the general (office-based) thinking is that with Intranet (behind the firewall), the Global Operations Control (GOC) via the telecomms equipment alarm monitoring system can connect to virtually every telecomms piece of equipment (both in the Backhaul and in the CAN), and most service issues can be either immediately resolved by a data table command change from the GOC, and/or later resolved by a field staff person when they next visit that site.

This computer screen realism mentality is endemic, and there really are field staff that are much like ‘board jockeys’ that travel from site to site (Backhaul and CAN) and replace faulty board assemblies, then commission the equipment back into service inside an agreed ‘time window’ in coordination with the staff in the GOC in Melbourne.

With first generation digital equipment of the early 1980s, this equipment had reliability Mean Time To Failure (MTTF) figures measured in decades, not weeks or days as it was with earlier mechanical and analogue equipment. Telstra was put in a very awkward position of having to put off thousands of highly trained technical staff. With the second generation digital equipment installed from about 1990 onwards, this ‘globally manufactured’ equipment had remote alarming and control such that it could be ‘managed’ from an operations centre, and Telstra was again in a very awkward position of offloading more than 90% of its remaining backhaul (core network and edge network) engineering and technical maintenance staff. This is the prime reason why Telstra now has a relatively young staff, and why contractors to Telstra are usually the older maintenance ex-staff! This is also the prime reason why Telstra’s staff, have a generally short historical memory.

So in general, now most exchange sites are totally unmanned, but nationally there is another field staff team that is basically CAN and peripheral/edge backhaul based, that installs and commissions new equipment, and this is the area that really needs to be trained up and soon.

Optical fibre is not nearly as simple to splice as compared to join copper wire pairs using insulation displacement connectors (IDCs). The optical splicing equipment is expensive, and each splice has to be measured and recorded well before the optical fibre cables are put into

service. Optical Fibre technology has come in since about 1986, and it is now used almost universally throughout the backhaul network, and business / enterprise CAN, to radio base stations (for mobile phones and mobile Internet), and the fibre component of HFC.

Australia has several hundred (if not a few thousand) trained field staff, but apart for some of those in the business / enterprise area, almost none of these staff have any background in optical fibre technology – particularly in splicing. When it comes to installing an optical fibre CAN, we are looking at say 10 M premises, and therefore about 30 M splices. If this were to be rolled out in say four years, then in round figures this is about 30,000 splices every weekday. Considering that a fast splicer will get through say 100 splices per day, then Australia will need at least 300 splicers working full time for four years, and these splicers will need the associated splicing and measuring equipment which costs about \$25,000 each.

Unlike general rack installation work, training in optical fibre technology is a precision job (understand the centre of the fibre is typically about 9 μm , not 0.4 mm as in urban pair copper cable). Learning the basics will only take a few days, but learning to do repetitive and precise splices, detailed field based measurements and accurate field recording takes months and a lot of patience; and these qualities do not suit the vast majority of the outside field staff.

I hope that this clarification explains to you how and why existing trained field and maintenance staff that have been displaced some decades ago may not be useful for the installation and commissioning of FTTP and the associated equipment interfacing into the augmented backhaul, and why Telstra had to make some rather unpalatable decisions about its own staff numbers. This addendum also shows that Australia will have to educate and train a small battalion of field staff that have Optical Fibre Splitter certifications (and experience), in the short term, together with the necessary and expensive splicing, testing and calibration tools and equipment.

Deutsche Bank Australia – CAN Copper in Ducting

While listening to the Deutsche Bank Australia evidence at the Select Senate Hearing on the 20th July 2000, I believe that Mr Sameer Chopra raised the option of NBN purchasing the CAN ducting including the copper cables from Telstra.

While this clinical approach seems quite simple and straightforward, from my experience and knowledge of the telecomms network in Australia, it was very apparent to me that there is considerable (optical fibre) backhaul in these same and adjacent ducts, and there is considerable very profitable optical fibre CAN to businesses in these same and adjacent ducts. *Copper is not Gold!*

My understanding of the Deutsche Bank Australia strategy was that Telstra would sell (to NBN) its CAN ducting that had copper cables in it (ie to the non-business community), and keep the rest (CAN with optical fibre to businesses and all the backhaul optical fibre)!

With all due respect I might have misunderstood this strategy, but as I pointed out in my evidence to the Select Committee that the telecomms end-to-end connection is a continuum, and that removing one part (like the CAN, or just the copper CAN) is extremely inept to say the very least.

One of Telstra's least profitable business areas is the fixed access telephone service using pair copper cable, and I am sure this will be phased out within 48 months, to be replaced by mobile phones, VoIP and optical fibre. I am sure that Telstra would be only too pleased to dump the ageing pair copper cables onto an unsuspecting buyer – along with a hoard of small ISPs that depend on naked ADSL connections to the customers from their DSLAMS.

A national telecomms infrastructure purchase of only part of the infrastructure will prove to be an extremely inept and very embarrassingly expensive business transaction. The CAN has to physically connect with terminal equipment that interfaces into the backhaul network that in turn passes through a transmission path to core backhaul switch/routers, and almost all this equipment is always located in exchange sites.

In light of this insight, I would ask the Select Senate Committee to be extremely cautious about recommending the purchase of obsolete “pair copper CAN ducting”, and *my recommendation to the Select Senate Hearing would go along the lines of “purchasing all the ducting irrespective if it holds CAN or Backhaul, pair copper, coax, waveguide, HFC, and/or optical fibre; and the associated street cabinets, sputniks, pillars, pits, poles etc. - and the telecomms facility sites including the radio base stations and exchanges.”*

A straight national telecomms infrastructure purchase may be extremely expensive, when a slight change in share ownership can cause the same effect for a mere fraction of the outlay, and achieve a far more economic outcome with a win-win situation.