

Response to Questions

The answers provided here are backed-up with far more less-engineering and more economic / historical / political explanations in detail on every topic (and sub-topic) for all answers that I have briefly provided in the associated document “**2021 04 20 Competition Wrecked Australia’s Telecoms**”.

Every response that includes a bold-italic title at the end of the paragraph has a mini-chapter in this associated document that includes far more detail that is highly relevant to the concise answer.

1a. What telecommunications services are required in Regional Australia to meet current and future needs?

Regional Australia is the core of Australia’s extremely valuable export economy that in turn provides the financial revenue for the high standard of living that Australians cherish and appreciate. What is not generally appreciated or acknowledged (particularly by most people living in Australia’s Metro areas) is that the telecoms service standards in Regional areas are substantially lower than the service standards provided in Metro areas. “**Surveying Australia’s Telecoms Wreckage**”

The fundamental engineering problem is that requirements are continually emerging and consequently telecoms connectivity specifications for service connectivity in Regional areas are slowly and continually tightening. This means that what was deemed appropriate 10 years ago (i.e. about CE 2011) do not meet the minimum expectations of today (CE 2021) and the future.

With this basic understanding, using specifications that met CE 2011 requirements and applying these to today’s needs / requirements is a fool’s folly. The basic Regional urban / non-urban telecoms connectivity specification for now must be built around the minimum needs for CE 2030 and universally applied.

The logical and simple reason for very high security low-latency telecoms is that all Stations, Farms and Mines (and associated urban residences) are both Businesses and family Premises (i.e. Homesteads). It is in these premises that often have substantial business transactions that can and do build Australia’s common wealth.

All premises in Regional Australia desperately require fast, low-latency, high speed, large monthly budget, very high security Internet connectivity (to all Homesteads, Localities, Villages, Towns and Cities) – performing substantially better than the best that is provided to consumer premises in Metro areas.

Circa CE 2010 the Metro (100% urban) expectations for telecoms connectivity were (in my professional and lived opinion) built around:

Voiceband (Fixed Access and Mobile Access):

Service Availability (Fixed): In every House / Home Unit / Factory / Office.

Service Availability (Mobile): Everywhere (except in some metal-clad buildings).

Reliability / Outages: no more than 5 minutes (720 seconds) unavailable per year (31557600 seconds) = 99.99771% reliable

Frequency Response: Clear enough to not be an issue (based on 200 Hz – 3400 Hz wrt 820 Hz), very much technology dependent.

Delay / Echo: Less than 200 msec, typically less than 20 msec.

Voiceband (Mobile Access)

Service Availability: Everywhere (except in some metal-clad buildings).

Frequency Response: Based on 200 Hz – 3400 Hz wrt 820 Hz), (2G phased out) 3G / 4G / 5G all use VoIP/SIP technology.

Reliability / Outages: no more than 5 minutes (720 seconds) unavailable per year (31557600 seconds) = 99.99771% reliable

Ping / Delay: Typically less than 20 msec.

Downstream Speed: >10 Mb/s

Broadband (Fixed Access)

Service Availability: In every House / Home Unit / Factory / Office.

Reliability / Outages: no more than 5 minutes (720 seconds) unavailable per year (31557600 seconds) = 99.99771% reliable

Ping / Delay: Typically less than 20 msec.

Downstream Speed: >4 Mb/s, typically 8 Mb/s

Using the above broad specifications instead of pages of waffle, **all urban Regional Areas (including Towns and Villages) should now be at least this specification.**

In Regional Non-urban areas (i.e. on Farms, Mining etc.) there are two different specification sets – one for in **Homesteads / Offices / Buildings – which should match and exceed that above for Metro Fixed Access**, and the other specification for Regional Telecoms connectivity in the Field).

The problem was that with Broadband emerging from about CE 1985 and all telecom manufacturing being globally engineered – it was all designed around European urban metrics (with short length Access Networks, typically less than 1500 metres) and the fall-back was to use Satellite for Regional non-urban situations in the northern hemisphere.

The use of geostationary satellites for Broadband connectivity into non-urban areas in Australia was in my professional opinion exceptionally naïve as **there is no way** the technology of a geostationary satellite (or hundreds / thousands of low orbit satellites) all with immense maintenance overheads can provide the much higher reliability that is imperative in Regional Australia – especially during storms and bushfires and widely varying temperatures.

In Regional areas, Access Network Outage time should never exceed 60 seconds per year.

Reliability / Outages: no more than 1 minutes (60 seconds) unavailable per year (31557600 seconds) = 99.99981% reliable

Similarly the Ping time should generally not exceed 35 msec and certainly not exceed 70 msec.

These two specifications should have excluded the use of any type of satellite technology for the NBN in the first instance – but it was not excluded.

The imperatives of high reliability and very high international security issues; these telecoms services must be provided by terrestrial means, i.e. not via satellite.

Satellite technologies (either geostationary or low orbit) are neither reliable enough (as neither technology in any way approaches a minimum reliability of 10 seconds down time per year = 99.99996%) nor is satellite internationally secure.

What is continually downplayed about (Broadband) Satellite Access is that the launch costs are extremely expensive, and the ongoing maintenance overheads are continuous and also very expensive as these have to be operated 24/7. Worse still most of these high continual operational costs are not internal to Australia, so these costs weight very heavily against Australia's Balance of Payments.

A fall-back of the failed NBN Satellite technology was the latent introduction of Fixed Wireless (nominally 2.3 GHz and later to also use 3.4 GHz) which in my opinion should have been the first option instead of geostationary Satellite.

The reasons are relatively straightforward in that the radio hop distance for Fixed Wireless is typically less than 8 km and when properly commissioned can withstand heavy rain, harsh winds and wide temperature variations. So this would be the choice except in most Regional areas the Backhaul connectivity is almost non-existent – so the effective downstream speeds are highly variable. ***“Competition Disconnected Regional Australia”***

At this stage we have Satellite which is a really expensive disaster and Fixed Wireless that is distance limited and speed limited primarily because the Backhaul connections are too few and far between and the transmission throughput is much under the necessary capacity for now and the future.

The (urban and non-urban) **Regional** Premises Specifications for **Broadband** in 2021 need to be at least:

Data Speed (Symmetrical): =>	100 Mb/s (preferably 1000 Mb/s when and if un-throttled).
Ping (Delay response):	< 25 msec (typical <20 ms)
Network Congestion / Contention:	<2%
Reliability (Network Dropout):	Less than 30 seconds in a year (31557600 seconds) = 99.9999 %
Data Budget	=> 100 GBytes /month

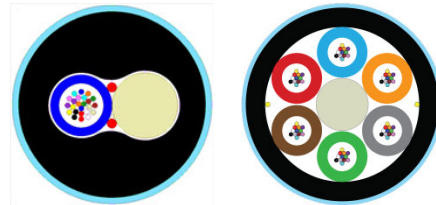
Economic non-urban non-premises telecoms connection specifications need a totally synergetic innovative restructure of the existing Regional telecoms infrastructure's ownership and management and I am happy to discuss how this can be done (much is included near the end of this answer and in 1b).

It is therefore imperative / essential that SMOF cable technology be far more widely rolled out and utilised in Regional Australia to provide the imperative Backhaul connectivity for terrestrial Access Network connectivity.

The underlying problem is that because Telecom was being privatised in the late CE 1980s, an absolute minimum of strands (i.e. 6) were included many thousands of km in most Regional SMOF cables in that era. **“Competition Wrecked Australia’s SMOF Rollout”**

When the Syd-Mel SMOF (31 strand) cable was rapidly ploughed in and PDH-based long-haul communications quickly installed CE 1986-1987 to very urgently replace the aged high maintenance thermionic valve technology FDM system, it most likely used the “prototype” cable design much like that on the left, below. **“The Sudden Emergence of SMOF”**

The “next cab off the ranks” was an urgent re-cabling of the Metro areas with 2 Mb/s PDH over SMOF cable, because 2 Mb/s regenerators were intermittently failing everywhere. This was a mix of 6 and 12 strand fibre cables and I believe also based on the “prototype” design. **“The Phenomenal Productivity of SMOF”**



The next “cab off the ranks” was the Regional areas and I am fairly certain that these cables also followed the “prototype” cable engineering design – because the number of telephones (in regional areas) had flattened out by the early CE 1990s so “growth” was seen was virtually zero for the near foreseeable future (5 years). **“Competition Wrecked Australia’s SMOF Rollout”**

The (not to scale) cross-section SMOF cable pictures above shows how these cable technologies (for ploughing) significantly improved. The cable on the right has the same outside diameter (about 14.8 mm) but is capable of 72 fibres.

SMOF is the obvious only reliable transmission technology to connect Regional (Rural and Remote) non-urban premises (and provide fast Broadband connectivity).

Telstra (and NBN) are certainly not going to plough in SMOF cable in Regional areas unless they can get a very fast ROI for their investors. (Having Telstra and NBN as corporate identities is a fundamentally flawed / incorrect business structure.)

Traditionally, the Access Network and Backhaul / Core Network have always been in separate (underground) cables. While this “works” in urban areas – it is extremely resource wasteful in non-urban areas.

The problem is that telecoms infrastructure was originally engineered for CBD and urban arrangements where there is a centralised GPO / Switchboard / Switch and a fundamental star network structure emanating from this central point.

When it came to engineering telecoms network structure there were most probably separate business divisions that insisted (for many decades) that their infrastructure was “separate” (much like local Roads and State / Federal Highways – under different administrations).

When it came to engineering non-urban telecoms structures – this difference was even more differentiated – and lacked collective “economy of scale”!

It makes immense economical common sense that the Backhaul and Access Network infrastructures use Single Mode Optical Fibre (SMOF) cable and use the same SMOF cable for the main route – with short spurs to connect Regional non-urban Homesteads.

A 48 strand SMOF cable such as the one depicted on the right above costs about \$3,000 per km and is less than 10% of the ploughing costs.

A single 48 – 72 strand SMOF cable could be readily used (ploughed-in) for both Access and Backhaul / Core transmission and effectively halve the ploughing costs. This initiative is under trial.

1b. Are there any things regional communities and businesses need to do, but can't, on their existing services?

As (recent) telecoms history has clearly shown, the (Broadband) Internet connectivity needs of the near future have again clearly outstripped the performance objectives of today, so it makes very little sense for the NBN Corp. to provide (i.e. Install and Commission) Broadband Internet services using technologies (such as Satellite and Fixed Wireless) that barely meet the minimum Broadband connectivity standards of today.

The rollout of appropriate Broadband services in non-Metro areas has been absolutely appalling and the threadbare Regional Broadband network is continuing to severely cripple Australia's Regional productivity (which is the core of Australia's economy) – and is costing untold \$Bns in totally unnecessary extra Social Services costs because of this much lower standard of communications in Regional areas.

In a sense, history is again repeating itself. The introduction of pair copper cable CE 1930 – 1950 (which was a much thinner diameter wire than in open wire technology) had a substantially greater insertion loss and frequency / attenuation roll off (“Slope”) than that of open wire technology. In those times, these lower communications standards caused a lot of subscriber complaints.

In most situations the accumulative “Slope” in the Access Network (at both ends of an end-to-end telephone connection) is not quite enough to make it hard to understand the other person talking.

Before the CE 1960s it was common practice for telephone installing technicians to use a “Shot Box” to prove (commission) the acoustic performance of the telephone carbon transmitter efficiency in the subscriber / customer premises.

The “button transmitter” in the “modern” telephone handset (CE 1960) has a broad frequency response with a peak of about 6 dB at about 4 kHz that largely equalises out the “Slope” in the average (Metro) telephone Access line length of about 2.4 km! From about CE 1990 this relatively simple innovation dramatically reduced the number of “can't hear” customer complaints!

By the mid CE 1970s telephone services were simply installed and Voiceband Service Quality was not being checked because the manufacturing Quality of

telephones had dramatically improved in the late CE 1960s. **“New Era of Electronic Components”**

The conflicting problem was that Telecom Australia Commission was privatised in CE 1989 and this new “business mindset” made a diametrical turnaround from continuous (proactive) improvement in Service Quality (to exceed the future needs of customers) – back to exceptionally large financial greed at the expense of Service Quality for end users. **“Infrastructure Business – Competitive Business”**

By the mid CE 1990’s the process of Commissioning (testing and recording results directly after installation to prove that Voiceband services were working to / above a specified standard) Voiceband Telephone and Fax / Data services was again becoming mandatory primarily because the Access and Backhaul Network infrastructure was far from being “up to scratch”, and the pair copper Access Network has continued to fall into further disrepair. **“Wiping Out Voiceband Complaints”**

As expected, most Metro and Regional ADSL2+ Broadband services dismally failed to meet anywhere near their intended performance standards. The prime reason why ADSL services were too slow was that the pair copper Access Network was in a pitiful state of disrepair – caused by the Competitive Business mindset. Broadband services were not commissioned (as was imperative); and Telstra’s Access Network was wrecked by financial Greed over Quality. **“Competition Wrecked Australia’s ADSL”**

Faced with losing Government the political party of the day gave Telstra severe warning to make Broadband available else it would be re-Nationalised!

Telstra jumped on its Cable Internet infrastructure and fortunately for the Metro areas only, in CE 2005/6 well over two thousand Cable Broadband Switch/Routers were relocated from geographically centralised exchange sites to 400 Metro local exchange sites and the Metro Backhaul Fibre Network was very extensively expanded and re-engineered to back-connect into pairs of Main Switch / Routers in Telstra’s Main switching sites in each State Capital city.

It was this extensive Metro Backhaul rebuild that was very reluctantly done (to prevent Telstra being nationalised), that set up a suitable Backhaul Network framework of Edge Routers in Metro Local Exchange sites for the NBN Corp’s Metro VDSL etc. Access Network infrastructure to very inexpensively back-connected. **“Competition Wrecked Australia’s Cable Internet”**

The benefit of this \$2.4 Bn rebuild for the Metro areas did not reach the Regional areas - apart from some Regional city areas having better Backhaul Internet connectivity to the State Capital cities – but they have no geographic diverse connectivity as is commonplace in Metro areas.

The Covid19 pandemic has shocked Metro Australia into using low-latency, low definition video conferencing on a highly regular basis. Video conferencing (and video streaming, and interactive video games) use far more Internet data transmission “network bandwidth” than virtually anything else – like Websites, emails and phone calls. This was a tidal wave of notice for Regional areas that the Backhaul network infrastructure is decades behind its minimum Broadband connectivity requirement. **“Competition Disconnected Regional Australia”**

Australia's Regional areas simply do not have enough fibre in the ground (nor any geographically diverse Main Switch / Router locations that would and should be located in all major Regional cities) to provide the Broadband connectivity that is imperative for Regional businesses and communities to have a level pegging (Backhaul network connectivity) with Australia's Metro areas. ***"Competition Wrecked Australia's SMOF Rollout"***

In the near future (a few years), most video conferencing will move to high resolution video cameras and this will cause a considerable increase in the amount of Internet traffic.

It is an urgent National imperative that an inland network of (nominally 72 strand) SMOF cable be ploughed in (directly) over most existing cable routes to provide the geographic route capability and diversity necessary for Australia's Regional telecoms infrastructure.

The high latency of the NBN's geostationary Broadband satellite technology is not suitable for video conferencing in Regional areas. The low latency and unreliability of the Dept Comms mooted foolish "Voiceband Experiments" (as a vague cover for providing Grant funding for incredibly expensive low orbit satellite technology) needs urgent and instant cancelling. (And sacking of staff involved with this rort.)

Metro premises with Cable Internet (well before the NBN Corp. panic rollout of VDSL) had the capability for clear and clean low latency Video Conferencing.

In the near future; High Definition Video Conferencing, extremely high security data transfer (e.g. by Blockchain technologies over secure Internet) and localised data storage are fast becoming standard business practices that requires high-reliability low-latency 100 Mb/s (and much faster) bi-directional connectivity in and with Regional Homestead data centres.

Ideally these imperative services for Regional areas desperately need to have FTTP technology – but it is uneconomic to use the age-old and mindset locked in centralised network architecture that has separately ploughed-in cables for the Access Network and for the Backhaul Network.

There is a far more economic (distributed) SMOF-based network structure that effectively more than halves the amount of ploughing and very significantly increases the extent of very economical FTTP to Regional Rural Homesteads. I have been actively involved in the development of this new technology for over five years. See my answer to Question 11.

Homestead-based 3G/4G/5G mobile connectivity is a prime (workplace) safety issue / initiative that needs a total re-visioning where Regional (mobile) Spectrum must no-longer be "auctioned off" to a Service Provider but must remain as owned by the Spectrum Management Authority / ACMA, where Homesteads become the 3G /4G / 5G Radio Base Station locations and are back-connected (usually by Fibre or point-to-point digital radio) directly into Regional / District Local Exchange Edge Routers.

This simple initiative would very quickly eliminate at least 90% of Radio Black Spots in Regional areas and fix a major workplace safety problem and significantly reduce the financial strain on Social Services in Regional areas.

2. What changes in demand, barriers or challenges need to be addressed when it comes to telecommunications services in regional, rural and remote Australia?

The recent Covid-19 pandemic has caused a significant change in office-based workplace practices, where it was standard practice to work in centralised offices – usually in Metro CBDs – to where it is becoming far more standard practice to work from a Metro located Home and/or work in Distributed Offices that are effectively moving out of the Metro areas and moving from the Metro areas into Regional Rural areas.

In most cases to date, people that have moved from a Metro residential area to a Regional Rural City or Town have been able to re-establish their work telecoms infrastructure because Broadband connectivity using VDSL (or FTTP) in these Regional Cities and Towns is comparative (at nominally 100 Mb/s downstream and 10 to 15 msec ping) and the telecoms service reliability is comparable to that in the Metro areas (i.e. dropouts are <60 seconds per year or 99.9996 % availability).

The underlying concern is that as the numbers of people who move from the Metro city / suburbs to work in Regional Rural Cities and Towns will substantially increase (which they certainly will in the next few years) and the Backhaul connectivity with the nearest Metro State Capital City - Main Switch/Router may not have the fibres in the Single Mode Optical Fibre (SMOF) cables in the Backhaul Network into the Regional areas to prevent mild even chronic Backhaul network congestion. **“Competition Wrecked Australia’s SMOF Rollout”**

The associated major concern is that a reasonably large proportion of office-based workers will move from Metro living onto farms in Regional Rural areas business and expect to have the equivalent Broadband connectivity (including 4G/5G mobile connectivity) as in their previous Metro environment (as outlined above)!

As I had long predicted, the NBN Corp. extremely expensive multi-beamed digital transmission geostationary satellite proved to be an extremely expensive absolute failure – hence the BIRRR for a starter. Because this satellite was so overloaded and unstable, the NBN eventually moved to introduce Fixed Wireless technology to try and reduce the network / switch congestion in the Satellite and its uplinks.

In principle Fixed Wireless Broadband technology would have been good – if the Field Staff were not sub-Contractors and had been properly trained to do Quality workmanship instead of working to a (minimum) Time Standard for installation and failing to do a proper Commissioning test to prove the connection.

My sister lives in a Homestead west of Orange (NSW) and is in clear site of Mt Canoblas (where the Fixed Wireless Radio Base Stations is located about 9 km direct path). Her Downstream speed is about 12 Mb/s (where it should be about 75 Mb/s). Her roof/gutter mounted Fixed Wireless antenna is not pointing directly towards Mt Canoblas and there is a hedge blocking the line of sight.

Had the installers positioned her antenna about 8 metres east (along the gutter line) then it would have a clear line of sight. Pointing the antennae to directly to face the transmitter site would have also been an advantage! Had the Installers commissioned the system they would have identified these faults and fixed them before their very rapid departure.

The other classical mistake made with Fixed Wireless was that (again) NBN Corp. (“Competitive Business” mindset – not an “Infrastructure Business” mindset); as it should have been as a Commission... not a Corporation – this needs addressing – far more urgent than global warming) cut (cost) corners and where possible mounted the Fixed Wireless Radio Base Station’s antennae directly on the Telstra Local Exchange roof – instead of identifying the highest available building in the Town – e.g. a Water Tower or a Grain Silo and placing the Fixed Wireless’s Radio Base Station / Antennae there – so that the line of sight is maximised, mirage reception minimised and connectivity is maximised, and customer complaints are minimised.

It seems obvious that the equipment installers are given the absolute minimum of training – and there is no standard Commissioning to check and prove that the equipment is working well above the minimum operating specifications limit.

It is ludicrous that the ACCC is managing the performance of NBN’s Broadband connections. For a start this is not the role of the ACCC but would be right up the expertise line of the ACMA – and why use “White Boxes” to measure Network Performance? This needs to be directly moved to the ACMA and a team in the ACMA needs to proactively address all under-speed problems.

With the development of software coding languages like JavaScript, XHTML, Python, JSON etc., the development of interactive websites has come a very long way since CE 2000 and it is now a very straightforward process to make a “Broadband Commissioning Website (and associated third-party software) that can in turn make Broadband commissioning a very straightforward process – much like using a QR code on entering a premises.

Taking this concept a bit further – on commissioning a “Bot” could be left silently in a computer (or – thinking more proactively - be more centrally located in the modem) to proactively store the time and speed, delay etc. of Internet usage – and at a later time transmit this to a central analysis centre so that faults could be proactively identified and acted on before the end users are aware there are network connectivity problems.

Executives in the NBN Corp. made a fundamental engineering mistake and implemented an extremely expensive multi-beamed digital transmission satellite to hopefully provide Broadband connectivity to non-urban Regional premises.

It is painfully obvious that the Federal Government (both sides) flatly refuses to admit that splitting up and privatising the Australian Telecom Commission (circa 1985) was a horrendous economic mistake that had crippled our economy. Further – even if clear directives are given in these and other Reports - the Federal Government refuses to act and fix the endemic problem caused by large businesses/ corporations not paying their fair share of due taxes.

This was a really false economy caused by privatisation and operating with a “Competitive Business” mindset to minimise costs wherever possible.

3a. How have the Government's policies and programs affected telecommunications service outcomes in regional, rural and remote Australia?

The Government's action to privatise Australia's infrastructures primarily came from the ANZUS Treaty that PM Robert Menzies was cornered into signing with the USA in CE 1953. "**External Economic Control from the USA**"

This Treaty virtually forced Australia was to privatise its infrastructures - as they are in the USA. This was diametrically opposite to the way that Australia was federated in CE 1901 with a Common Wealth of (Government owned and managed) Infrastructures; hence the deliberate wording of "The Commonwealth of Australia".

Following the USA annihilating Chile's economy CE 1970, Australia was pushed and the CE 1973 Vernon Report broke up the PMG's Department into a few technology specific Commissions – Post Office, Telecom, and a few others. This streamlined most of the main decision making in these Commissions to not be Acts of Federal Parliament – but it did not go nearly far enough and the USA kept pushing Australia to privatise our telecoms. "**The USA Muscles itself into World Dominance**"

If ever there was a reason why we were taught "fairy stories" then the classic about "Cinderella" is a close match – with the Step Mother (USA) and Ugly Sisters (competition) ruining Cinderella's (Australia's) economic functionality and fighting for the crystal slipper (privatised infrastructures) – while the Step mother and Ugly Sisters were being less than useless (totally unnecessary and exceedingly expensive Sales, Marketing and Sponsoring) – as Cinderella was gradually wiped out.

It took several years for Telecom Commission to be flogged off (majority to USA Equity houses) and from there Australia's telecoms (and economy) were shattered (just like the crystal slipper). The Prince is re-nationalisation without the private sector corporations of greed and shallow direction!

The wording of the Davidson Report (CE 1982) was taken as literal and in the Report "telephone" at that time meant "telecommunications" – with legal tautology it now meant "telephone" – at an immense expense to Australia's Regional community and business – as this also excluded Broadband!. "**The Davidson Inquiry and Report**"

The direct result of the Davidson Report (CE 1983) was that the Infrastructure Business focus of providing equitable telecom services for all Australia (particularly in Regional and Remote areas) was very rapidly and thoroughly crushed (in the mid CE 1980s) with the Competitive Business mindset of providing maximised telecoms service where the profits were greatest (i.e. the Metro areas) and deliberately minimising services that were (internally accounted) as not profitable – the Regional areas – at an immense ongoing cost to Australia's economy.

There have been more than (useless) 15 Select Senate Inquiries, more than 4 Regional Inquiries and several other inquiries, plus the ACCC and Productivity Commission (which is an oxymoron in itself) had academics who have never worked in a telecom environment keep hamming-on about increased competition improves service standards and brings down end used costs.

From my over 40 years: technical, engineering, professional management and consultancy in Australia's telecoms industry – I know and can prove that exactly the opposite is true. The massive overheads of sales marketing and advertising /

sponsoring have really driven end user prices way up – and it is only that the newer technologies have cavitiated build costs and zeroed operational overhead costs that it makes it “look” as though increased competition has (marginally) reduced prices.
“Competition Wrecked Australia’s Telecoms”

None of these Inquires have gone anywhere near approaching the “elephant in the china shop” (privatisation / competition) – that precipitated these adverse situations.

3b. How can these be improved?

- 1 Get the NBN Corp and move it back to be a NBN Commission directly under the Dept. Communications and the Arts. (and get rid of the Lawyers)
- 2 Remove all Advertising and Marketing from the NBN Commission
- 3 Remove all the Telstra non-Metro network (including backhaul transmission and all non-metro exchanges / SCAX huts and Radio Base Station sites) – and transfer all this infrastructure to the NBN Commission - including the USO.
- 4 With the ACMA – remove all auctioned non-metro 3G/4G/5G Fixed Wireless and transfer this to the NBN Commission
- 5 Re-engineer the DRCS/HCRC (now with the NBN Commission) for 1 Gb/s point to point IP Backhaul in Regional Remote areas.
- 6 At villages that do not have DSL – put in DSLAMs for now (providing ADSL2+) and remove the telephone switches – the customers will have fixed access telephones off the ADSL2+ for the meantime
- 7 Now that the Regional SMOF Backhaul cables are freed up of 2 Mb/s PDH – these can now be re-used the for 10 Gb/s IP for inexpensive Fixed Wireless / 3G / 4G / 5G and along roads too.
- 8 Start ploughing in 48 and 74 strand SMOF cables directly over existing 6 and 12 strand SMOF cables to provide national inland connectivity
- 9 Most non-urban homes have orb steel roofs which are shields against radio strength – this needs a major rethink on radio (Wi-Fi / 3G / 4G / 5G / Fixed Wireless) connectivity in Homesteads.
- 10 Talk with me !

It would really help if the Review/Investigation panel had people in them that actually understood the engineering of the telecoms infrastructure, and not politicians / business / career people that have no background telecoms knowledge – but are there to bolster their career resume.

It would also be of great benefit if those on the Panels actually read in depth the responses and had a list of meaningful questions to ask the “witnesses”.

I have been a witness on several Inquiries and found it repetitively disappointing to find nobody on the most of these Panels had even opened submissions – let alone prepared any questions. These idiots wait for the “witnesses” opening statements

and then (like Lawyers and Judges) frame either intended rhetoric questions or ask extremely simple questions that go nowhere – and the report are “waffle”.

The worst cases are Panels that as (technical/engineering) answers are provided, it very quickly becomes obvious that those on the member on these Panels have no relevant knowledge of telecoms infrastructure – and the answers are immediately neglected – and/or vehemently opposed because economic engineering-based answers sit uncomfortably with their entrenched ideological political / economic bias.

It is easy to identify a hopeless Panel when their Report merely states an outline of the obvious situation and **there is no** political / economic / engineering strategy / initiative together with a timely schedule to fix the problems. **“The Privatisation Wheels Fell Off”**

4a. How do service reliability issues impact on regional communities and businesses?

In Regional areas; distances are much further, resources far more rare, and travel is far more time consuming than in Metro areas. Consequently, any lack of telecoms service reliability far more negatively impacts on productivities and efficiencies of Regional businesses and communities than in Metro areas.

Australia’s prime / main exports that builds our Balance of Payments are from unrefined/processed mined ores, and from farming / grazing produce that all come from Regional areas. Almost all these exports are not value-added in Metro areas.

It therefore logically follows that telecoms infrastructure in Australia’s Regional areas needs to be far more robust and reliable than that in the metro areas. The opposite is true (hence yet another Review – going nowhere) and the margin between Australia’s Regional telecoms infrastructure and Metro telecom infrastructure is now even wider. **“Competition Disconnected Regional Australia”**

It confounds economic common sense that Australia’s Regional telecoms infrastructure is threadbare and very aged, yet in the Metro areas that have no export value; this telecoms infrastructure is multi-duplicated with new technologies being sold by competing retailers with very high advertising / marketing / sponsoring costs.

The metropolitan areas have multi-duplicated geographically diverse backhaul connectivity and short length Access Network connections but the Regional areas have no duplicated geographically diverse backhaul connectivity with the Core Network and in most Regional non-urban situations these have very long and inherently unstable (satellite) Access Network connectivity to the Core Network.

The Regional telecom network needs a thorough rethink and rebuild to use Single Mode Optical Fibre (SMOF) as the primary transmission bearer technology – for Backhaul and for Access Network connectivity.

It is not common telecom engineering knowledge that Single Mode Optical Fibre (SMOF) digital transmission is inexpensive to roll out and SMOF technology is orders of magnitude (10, 100, 1,000 times at least) more reliable than point-to-point radio e.g. digital Satellite technologies (geostationary or low-orbit). Consequently manual

operational overheads of SMOF transmission technologies are virtually zero from the day they are commissioned for at least 40 years.

A typical SMOF cable as would be ploughed underground in Regional Rural / Remote areas consists of a fibreglass / polyurethane strainer (in the centre) surrounded by several neoprene “sections” (or sub-tubes) each carrying up to 12 fibres all in a thick polyethylene sheath inside a thin nylon outer sheath (so ants don’t eat it)! A SMOF cable like the cross-section on the right has 72 fibres, is about 14.5 mm diameter and costs about \$3600 per km.



Radio communications are “unbound” making this technology particularly susceptible to compromised transmission security – particularly with satellites. SMOF is bound transmission (inside the fibre) which is inherently stable and extremely secure. Each “pair” of fibres is equivalent to a pair of radio transmission paths – but without the reliability / outage problems of weather, smoke and without excessive delay.

Satellites are extremely expensive to launch and require very expensive 24/7 surveillance and monitoring. Geostationary satellites have a life of about 6 years before they have to be replaced and Low Orbit satellites have a shorter lifespan – and rely on wide international usage to mitigate their phenomenally high overheads.

The impact is that Businesses and Communities in Regional areas of Australia are heavily compromised because the telecoms infrastructure was/is certainly not “up to scratch” (*as obviously deliberately falsified by PM John Howard so he could force the bulk of Telstra Corp. shares to be sold – with the majority of TLS shares ending up in USA Equity corporations at immense economic cost to Australia*). The force-privatisation of Telecom Australia Commission was in my opinion virtually treason, and is the prime cause for this ever-widening technology appropriate gap that is still slowly killing Regional business and Australia’s economy.

4b. How do outages, including in natural disasters, impact on communities and businesses?

In Regional areas, (particularly Regional Remote areas) it is the prime imperative that telecoms connectivity is highly reliable (i.e. has very few if any outages), has low latency (so voice communications can be un-interrupted) and is capable of very fast data transmission (so that Websites / Emails and financial transactions can be conveyed with a minimum of delay and maximum of certainty).

These communications are with very tight security, especially during natural incidents / disasters (like bushfires, storms, floods medical emergencies, remote education, social events, financial / confidential business transactions, work scheduling etc.).

Instead of talking “waffle” (*meaningless statements that really define nothing but fill up pages*) – putting some engineering network performance figures around this waffle come out like this:

The term “Outages” is another word that means there is no connection to or from a Business / Home premises through into the telecoms Core network.

In virtually all Regional (Rural and Remote) areas, the telecoms network is a “Tiered Star” structure where there is one connection from the Homestead premises to a local Node (which is part of the Access Network) and then one Backhaul connection

from the local Node to the Edge Router (which is part of the Backhaul Network) that connects into the Core Network. The Core Network is fundamentally a national Internet loose matrix (or loose mesh) that is primarily based in the State Capital Cities with extensions to Regional Centres.

Outages are measured in terms of the reliability of the associated network as how long they are not connected over a specified time – typically a year.

Access Connectivity Outages: Each Premise is allowed more than 60 seconds per year to not have connectivity to the Node via the Access Network.

One Year = 31667600 seconds, so $(31667600 - 60)/31667600 = 0.9999981 = 99.99981\%$ and when converted to parts per million reads as 1.9 ppm.

Backhaul Connectivity Outages: Each Node is allowed more than 10 seconds per year to not have connectivity to the Core Network.

One Year = 31667600 seconds, so $(31667600 - 10)/31667600 = 0.9999996 = 99.99996\%$ and when converted to parts per million reads as 0.32 ppm.

Latency / Ping/ Echo all relate to almost the same concept being the amount of time taken for a signal to bounce back from the distant end. In a perfect world this would be zero time but in practice we have to look at Regional (Remote) Australia and consider big distances to twice pass through the Access, Backhaul and Core Networks and consider the practical worst case conditions.

Latency / Ping / Echo Time: No more than the time taken to cross Australia twice east – west; assuming a SMOF connection (where the speed of light in the SMOF is nominally 0.6 that of light in free space) plus allow time for 8 kHz Voiceband encoding / decoding. Note: this does not take into account possible considerable extra time for Switch / Routers to package large data chunks in the process.

The distance east-west of Australia is about 4,000 km (almost the same for north-south crossing Australia). The speed of light is 299,792,458 metres per second or about 299,792 meters per millisecond, or about 299 km per millisecond.

For $2 * 4000 \text{ km} = 8,000 \text{ km}$ this will take about $8,000/299 \text{ msec} = 26 \text{ msec}$ and accounting for SMOF transmission this is about $26/0.6 = 44.6 \text{ msec}$ as the absolute worst case condition.

Including Voiceband Encoding / Decoding of about $12.5 \text{ msec} * 2 = 25 \text{ msec}$; the worst case latency / ping / echo time must be less than $45 + 25 = 70 \text{ msec}$. Typically latency / echo / ping time shall be below 35 msec.

Because of the nominally tiered-star network structure of the Australian telecoms infrastructure in Regional Remote areas of Australia (done so to minimise network construction costs with the “tyranny of distance” as “crying crocodile tears” in the Davidson Report), there is virtually no difference between failure in an Access connection (affecting one or a few geographically near end-users) and a Backhaul connection (affecting several users over a much larger geographic area).

Since about CE 2000 (over 20 years ago) there was a traumatic technology change with Broadband Internet becoming a main parallel to the previously well-entrenched Voiceband (telephone / dial-up) switched transmission network.

In Metro areas the technologies of ADSL and Cable Internet provided excellent Broadband connectivity – with the exception that “Competitive Business” practices in Telstra effectively wrecked ADSL2+ speeds and Cable Internet connectivity.

In Regional urban areas (country cities, most towns and some villages) ADSL2+ Broadband connectivity was also introduced – but again “Competitive Business” practices in Telstra effectively wrecked ADSL2+ speeds and connectivity.

There are mini-chapters in the associated document “2021 04 20 Competition Wrecked Australia’s Telecoms” that outline the technologies and explain how, when and why Australia’s telecoms infrastructure is such a basket case.

In Regional non-urban locations, Telstra had a very strong financial incentive to not provide Broadband connectivity to Homesteads etc. – and this was seen as a massive “cost centre” by Telstra; also possibly impacting on the very lucrative USO gifted by the Davidson Report to Telecom Australia/Telstra.

AUSSAT was (and still is) providing (limited) and very expensive Broadband connectivity for some businesses in Regional Remote sites.

The cost of not having comprehensive inland alternate call path routing in the Backhaul and Core Network structures impacts very negatively on the Quality of the telecoms network connectivity, that in turn costs Australia \$Billions in lost productivity and in considerably extra Social Services costs.

5a. How might such impacts be addressed to ensure greater reliability?

It should be painfully obvious that the technology of the (NBN) Broadband Network in Regional Remote areas is using geostationary satellite technology, and this technology is fundamentally inappropriate as it does not have the robustness that is imperative for Regional Remote areas. (Also the transmission delay is far too long to be practical, and geostationary satellite technology is far from being secure!)

The Dept. Comms recently sent out a paper asking for comments on (i.e. reasons to approve) “Voiceband Trials” in Regional Remote areas. I am exceedingly sceptical that this is really a massive cover-up to justify these public servants being heavily compromised and I strongly suspect they have signed off on an immense amount of Government funds on low-orbit satellite as a supposed quick fix for geostationary satellites. From my communications with these public servants I seriously doubt that any of these people has any relevant engineering experience. Further I am extremely sceptical that low-orbit satellite technology has anywhere near the necessary reliability that is imperative to Rural Remote (and Regional) Australia.

Satellite technology involves tremendous launch costs and ever-continuing 24/7 overhead costs that make any form of Satellite technology (for providing highly reliable Broadband Access connectivity) an entirely uneconomic proposition for Regional Australia.

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In Regional Australia there is a very extensive network of over 900 DRCS/HCRC masts and radio equipment using the L band around 1.5 GHz. Recently I have been

very reliably informed that these masts (that were installed CE 1978 – 1985) are still in excellent condition – particularly those that are inland.

Since the HCRC technology was manufactured and installed, electronic technology has come a very long way and these days it is practical and to manufacture an inexpensive L Band Transmitter/Receiver that would sit on the existing antenna's back and connect through a Small Form Profile (SFP) Gigabit Interface Converter (GBIC) to directly connect with Single Mode Optical Fibre (SMOF) at nominally 1,000 Mb/s bi-directional IP (Internet Protocol).

The power drawn by this new equipment would be a small fraction of the earlier 1.5 GHz (L Band) Transceiver, (and NEC telephone circuit Line Concentrators) and the SMOF cable can directly connect into a compact low power Switch/Router to provide several Homesteads with reliable Broadband from the Radio Hut using FTTP, FTTN, 3G / 4G / 5G and Fixed Wireless technologies.

5b. How can the network resilience be addressed in regional areas?

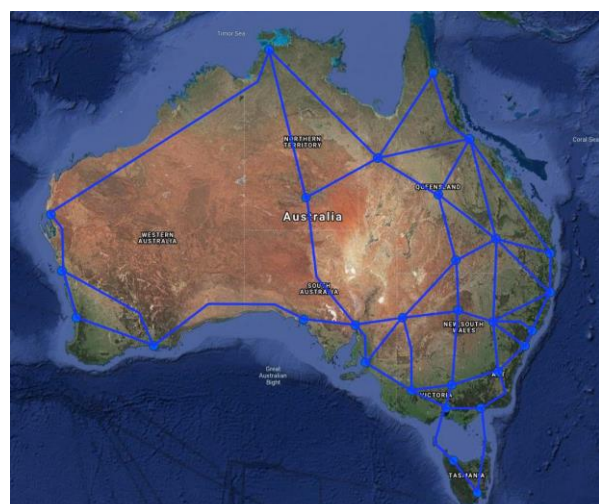
Network resilience (i.e. robustness) in Regional areas is very economically achieved by having a grid of inland Switch/Router Nodes (ideally located in the larger Regional Cities (say 30 Regional Cities in Regional Australia) and having these Switch / Router Nodes connected by a broad grid/mesh of SMOF cables at nominally 10 Gb/s (or 100 Gb/s) per fibre pair – where the Regional Cities nearest the State Capital Cities are back connected into this at their Nodes.

There is an extremely economic “Katherine wheel” spin-off in that such an inland high capacity SMOF-based Backhaul Network grid – with inland Regional Switch/Routers substantially improves network robustness for Australia’s National economic and military defence and co-incidentally also significantly improves inter-Metro connectivity – so it is a real “win-win” situation!

The map on the right is a first glance consideration of a Regional network Backhaul grid and associated Main Nodes that might become the basis of a Regional Core Network.

This proposed inland loose grid network structure is far more robust than the current thin inter-Metro structure.

This type of network structure cannot be economically done by competing service providers because they do not have the “economy of scale” that is imperative.



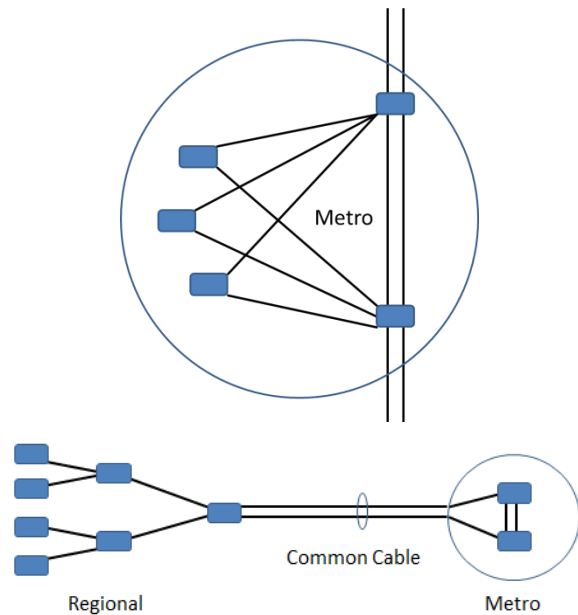
The more the competition the lesser is the “economy of scale”!

Academic economists perpetually pushing the: “competition is great” barrow need to get outside their university walls and work as network planning engineers in a large telco for a few decades to get a dose of reality.

6a. How did the use of digital services change for regional consumers and businesses during the response to the COVID-19 pandemic?

The covid-19 pandemic jump accelerated the move for city office workers to operate from their premises instead of working in main city offices. In metro areas – because most metro home premises now have VDSL or Cable Internet (both capable of low latency 100 Mb/s) virtually all office staff could – with suitable multi-location application software on their home desk/laptop computers – and with a fixed and/or mobile phone; work from their home residences and be highly effective.

Because the backhaul structure in the metro areas is based on a pair of geographically diverse Main Switch / Routers (on the right) in each of the six State Capital Cities (i.e. metro area) that have dual SMOF transmission to total of 400 local metropolitan exchange sites (on the left), this network was very robust and provides excellent Internet connectivity.



The diagram on the right is typical of Regional connections where the Backhaul is usually through the one same long-haul transmission system.

This Regional Backhaul network structure is very thin and not nearly as reliable as that in the Metro areas.

People that would have otherwise travelled to and from satellite cities near these State Capital cities also had quite good Internet connectivity and could work from their premises - and not endure over two hours travel on road (car / bus / truck) and or rail travel per day, plus waiting at public pick-up/set-down stations . All reports that I heard said that their productivity was increased as they could work any hours (in most cases) but there was a considerable lack of social association.

This was taken to another level where a small portion of what were city office workers that re-located into regional areas up to about 150 km from their metro areas. My understanding was that most of these urban localities had VDSL as their Access Networks and because the Backhaul infrastructure was built with spare capacity, their incremental network requirements did not unduly affect their Internet service.

The problem is that people are now moving from Metro urban locations to work from Regional Rural non-urban locations – and they naturally expect the same (or better) connection speeds and reliability and latency as in the Metro areas. They certainly will not have equivalent connectivity with Geostationary satellite (or low-orbit satellite) and Fixed Wireless technology is at this stage questionable – as are the “Sam Knows” reports (in my professional opinion) on Internet connectivity to the ACCC.

6b. What insights for future service delivery does this provide?

When ADSL2+ was competitively rolled out (in urban areas) there were no commissioning specifications and this absence was a prime reason why ADSL2+ Broadband connectivity was an abject failure. If a simple specification had been used then over 50% of ADSL2+ services would have failed to meet minimum standards.

The prime reason why ADSL2+ technology failed was that the twisted paper-insulated pair copper wire in most of the Main and Intermediate cables (leading from the local exchange sites towards the urban premises) have water ingress that causes these cable to electronically look far longer than they physically are – resulting in downstream speeds (in particular) to be far slower than physical length expectations.

With Fixed Wireless connections to Homesteads: these Broadband Access connections need to have a clear (downstream and upstream) data speed criterion (specification) that must be passed (signed off) before handover to the end user.

As a long-term professional telecoms engineer it is very clear to me that satellite solutions for Broadband connectivity are unreliable / intermittent, very expensive to maintain and have monthly data budgets that are far too small to be practical.

Had I the position and authority I would summarily fire the person that recommended Broadband satellite, and the people that very stupidly signed off on such an inappropriate Broadband technology for Regional Australia (and close it down ASAP).

7. What can be done to improve the access and affordability of telecommunications services in regional, rural and remote Indigenous communities?

All sides of Federal Government need to very seriously take on board that privatising the Australian Telecommunication Commission (as spelt out in the Davidson Report CE 1982) was a fundamental gigantic economic mistake that has strongly contributed to crippling Australia's economy from about CE 1997, when the privatisation wheels had well and truly fallen off and it had become obvious that Telstra was focussed on maximising shareholder value (the majority of which is in the USA) as opposed to maximising robust telecoms connectivity (particularly outside the metro areas).

The fact that there have been well over 15 subsequent Inquiries and Reports (including this one) plus several rather ill-conceived and very short-sighted "initiatives" to (including the "Universal Services Obligation" to falsify justifying privatising Telecom Australia Commission, "Networking the Nation" to provide critical regional infrastructure that had deliberately been excluded, a few other "brain snaps" and then the "National Broadband Network" in its several reducing versions, have all screamed out that Australia's telecoms infrastructure must be a Federal sub-Department Commission and not several infighting private sector businesses!

A first step to stop wrecking Australia's economy would be to draw the NBN Corporation back to being NBN Commission and sit this directly under the Department of Communications and the Arts. This simple restructure will cause a 180 degree change in the executive management focus – to focus on significantly

improving access connectivity, robustness and affordability of telecom services in Regional (Rural and Remote) areas.

The next step is to transfer the entire non-metropolitan Telstra network infrastructure to the NBN Commission along with the USO funding. For decades, Telstra has been bemoaning this Regional infrastructure as being a “cost centre” – so now it is off their books, and it is on the NBN accounting books.

The next step is minimising the Radio Black Spots that have become a political rort process. A good 80% of these Radio Black Spots (all over Australia) can be very quickly economically eradicated and I will explain how – but not here and now!

8. How can investment in telecommunications infrastructure work with other programs and policies to encourage economic development in regional Australia?

In a competitive situation, investment in telecom infrastructure is not economically efficient as the economy of scale is minimised – which in turn makes investment in telecoms infrastructure far more expensive and less robust (i.e. less reliable).
“Infrastructure Business - Competitive Business”

My father was a country lawyer and spent most of his time resolving problems for other people that should never have arisen.

When I was about 12 he took me aside and had a chat about problem solving. It went like this:

If the situation is awkward / uncomfortable / has angst / the agreement is long-winded and complex – then it is wrong. Go away and think of other ways the process can be done – think laterally – and try these different resolution strategies. This can sometimes take weeks to come up with an entirely different approach.

When you think that you have a workable strategy then work it through and see how it all comes out.

If you have the right strategy then the resolution process and practice will be really easy and straightforward – implement that strategy!

Question 8 is an entanglement of a mess that is entirely back-to-front.

With the appropriate telecom infrastructure in place (in Regional Australia) then there is no requirement to encourage economic development (in Regional Australia) – because economic development will use the appropriate telecom infrastructure.

Clearly then the minimum telecom infrastructure that has been rolled out in Regional Australia by Telstra Corp and then the NBN Corp is far lower than the minimum required in Regional Australia!

Obviously the “Corp” is the wrong structural body to roll out telecoms infrastructure in Regional Australia!

9. What role could innovation, including new models, alternative investors or new ways of doing business, play to encourage investment in regional telecommunications infrastructure?

With no thanks to the Davidson Inquiry and Report (CE 1980 - CE 1982): Providing the Telstra Regional areas keep making a financial loss, the USO “gravity train” would continue ongoing funding from Consolidated Revenue of about \$177 M pa indexed to the CPI. So it is in the interest of Telstra to keep the Regional areas operating at a financial loss! Currently the USO is worth about \$233M pa to keep the Regional areas operating at a loss. (**Discuss with me.**)

This question has the economic model fundamentally backwards – a bit like driving a B-Double down the wrong side of the Pacific Highway and wondering why cars are swerving / crashing to get out of the way of the oncoming oversized vehicle.

Putting in Regional telecoms (and “Quick” rail etc.) infrastructure (with economy of scale economics and an “infrastructure business” mindset) sets up localities to encourage innovation and new business models to use the (newly) established infrastructure. Not the other way around – and that is why you don’t have the private sector putting in infrastructure – unless you are planning to fail.

The short snippet is how you plan to excel – not fail.

In CE 1986 I was a Class 1 Engineer in the Australian in Telecom Commission (with 19 years technical experience) – learning the “ropes” of being an Engineer. For a month or so I was in Network Planning where I was tasked to work out the required telecom resources for several “visioned” suburbs around Penrith – about 55 km west of the Sydney CBD.

This was intrinsically interesting because we then lived at Emu Plains on the western bank of the Nepean River adjacent to Penrith. The designated areas were simply farm-land and scrub – but the Local Council had rough plans and I used these to work out the preliminary Access Network requirements – including new suburb CBDs, Industrial areas and the requirements of new / larger Telecom Local exchange buildings.

This build was planned for about 5 to 15 years ahead and for about 20,000 to 25,000 new premises / offices. My planning specifications became the blueprint for other Engineers to work out the structure of the pair copper Access Network and to significantly augment a few exchanges near Penrith before these satellite cities started to be developed.

Another part of this planning involved considerably augmenting the size of the switches in the Penrith telecom exchange plus the much larger Backhaul network transmission requirements to much better connect Penrith into the Sydney metropolitan network to maximise robustness.

Nowhere in the above example is there anything about getting a return on investment (in the standard 2 years) or encouraging investment (for telecoms entrepreneurs).

Everywhere in the above example was about providing the (Voiceband telephone) infrastructure in a timely manner so that the influx community and businesses can be properly serviced with appropriate telecoms infrastructure. Their business and community taxes will pay for these infrastructures in the next decade plus.

It should be obvious from this example that the “horse came before the cart” and the planning (and purchasing) for the infrastructure was several years well ahead of the areas being developed. So when the areas were developed (which they certainly were), all the telecoms infrastructure including Backhaul connectivity was very well catered for (with no surprises) and the rollout was in a very timely manner.

The exception was that Telecom Australia Commission was privatised in the interval, and accountants (with a short-term commercial focus) insisted that Crossbar switching equipment (destined to inexpensively augment for some of the exchange sites) be smashed and cashed for short-term financial liquidity. This private sector short-term “competitive business” mindset stupidity / madness left thousands of customers with no telephone services for some months. Go figure!

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Regarding innovative telecoms infrastructure in Regional Rural areas, this comes in two sections starting with some basics about Single Mode Optical Fibre (SMOF) and its use in telecoms in Australia. The second section outlines some innovation!

The technology of Single Mode Optical Fibre (SMOF) as an almost perfect transmission medium that finally (after more than a decade of research – primarily by Telecom Australia in Melbourne) burst on the scene in mid-April CE 1986.

The fibres are thinner than a human hair and are very inexpensively and quickly manufactured. The transmission is “bound” so it does not cross-talk into other fibres and the attenuation per unit length is exceptionally low – so regenerators can be more than 80 km apart (which is about 10 times the distance with pair / quad and coax cable technologies), and now the Internet Protocol (IP) based regenerators are small and very inexpensive. In practice the cable sheath is far more expensive than the fibres – and the sheath is inexpensive plastic!

The first rollout of SMOF transmission (CE 1986 – CE 1987) was a very urgent replacement of the Syd-Mel long-haul and very high maintenance Frequency Division Multiplex (FDM) high capacity network. This first initiative had a 31 fibre cable using Plesiochronous Digital hierarchy (PDH) technology and was a “prototype”. Subtle improvements were made to the cable manufacturing for all ensuing SMOF cables.

Next cabs of the ranks (CE 1987 – CE 1990) were the Metro areas to get their pair copper inter-exchange Junction networks replaced with SMOF. Why? Because the Metro areas made fast ROI and the 2 Mb/s regenerators used in these pair copper cables were intermittent – dropping out 30 telephone calls at a time. The regenerator manufacturer had decreased the chip size to make more profit – but that made these regenerators intermittently unstable. So, self-inflicted competition was terminal!

The SMOF technology used in these Junction cables was “proof-of-concept / small production” with nominally 6 sub-tubes of up to 12 fibres each (maximum of 72 fibres per SMOF cable). As this was a direct replacement process for typically 50 pair cable, and 2 fibres carried 2 Mb/s (30 Voiceband channels), most metro SMOF cables had only 6 or 12 fibres in them. This mindset was in line with “minimising costs” in preparation for competition to keep overheads / equipment costs minimised and maximise shareholder dividends and executive remuneration!

No surprises, the Regional Rural areas were the last areas to have pair copper inter-exchange (Transit) cables replaced by SMOF technology (circa CE 1990 – CE 1993) and this was after Telecom Commission was split up and privatised (CE 1989).

Primarily because (fixed access) telephone numbers had flattened out with (Rural) population, there was very little perceived increase in future telephone call density. So most 20 or 50 pair Transit cables (between Towns / Cities and Villages) were directly replaced by 6-strand SMOF cables and only the main (typically coaxial) cables were replaced by 12-strand SMOF cables.

With the introduction of Broadband in the late CE 1990s the need for extra bandwidth in the Backhaul transmission network was critical.

In the Metro areas it was relatively inexpensive to “rod and rope” thousands of km of SMOF cables (typically 12 or 24 or 48 fibres) into existing under-footpath conduits to provide plenty of inexpensive intra-urban connectivity.

In the Regional areas it was now very expensive to plough in thousands of km of SMOF cable and much less costly to use hand-me-down PDH transmission equipment from the Metro areas to get inter-City connectivity – but this left no spare fibres anywhere in the Regional areas!

Regarding innovation in telecoms, for reasons I could never understand; the Customer Access (transmission) Network (connecting customer premises to local exchange sites) and the Backhaul (transmission) Network (interconnecting between exchange sites – no customers) have always been physically separated.

While this physical separation concept may have worked well for open wire transmission, when it came to (pair / quad copper, coaxial) transmission cables being ploughed in the ground; this meant at least twice the installation cost – because ploughing a cable into the ground is an expensive process.

My professional opinion is that in regional Rural Australia it makes very sound engineering to “think big” and use a 72 strand SMOF cable as a direct plough-over of many of the existing 6-fibre SMOF cables – and use these new SMOF cables for both Backhaul Network interconnection between urban centres (Towns / Villages / Cities) and for providing Homestead Access Network connections (FTTP) from the nearest urban centre, and for providing plenty of connectivity for roadside Radio Base Stations for mobile devices and other future uses.

9b. What are the barriers to innovation, including new models, alternative investors or new ways of doing business, play to encourage investment in regional telecommunications infrastructure?

The only barrier is the Federal Government and Opposition that refuse to immediately Nationalise Telstra and Optus and the NBN as a sub Department Commission and use the then inherent economy of scale Commission to proactively roll out the appropriate telecoms infrastructure in a timely manner.

10a. To what extent will new technologies enable significant change to the delivery of telecommunications services in regional Australia over the next 5-10 years?

This question is very thinly-veiled to facilitate fools in the Dept. Communications and the Arts to quietly justify the absolute wasting of immense amounts of Government funds on low-orbit satellites – which are totally inappropriate for Regional Australia.

So kill low-orbit satellites ASAP.

The only new technology that will almost immediately enable a very significant improvement to the delivery of Broadband (and Voiceband as a subset of Broadband) services in Regional Rural Australia will be the highly economical introduction of Fibre to the Homestead (FTTH) through using a distributed network structure where the Access and Backhaul fibres are in the one SMOF cable (so the cable ploughing costs are literally halved – with Homesteads being inexpensively connected to very fast, very reliable / robust FTTH instead of being “passed”.

The typical connection speed will be 1,000 Mb/s downstream and upstream with a latency of less than 20 msec and a reliability / robustness where network dropout is in the order of less than 10 sec per year out of service - irrespective of the weather / floods / fire etc. That is a reliability of about 99.999961 %

10b. Are there any barriers to accessing these new technologies enable significant change to the delivery of telecommunications services in regional Australia over the next 5-10 years?

With the sub-Department Commission totally focussed on providing non-urban distributed SMOF-based FTTH technology based on AON not PON to the Regional areas this will take between 5 to 10 years to roll out.

11. How can Government better support the rapid rollout of and investment in new telecommunications solutions in regional areas?

This question is incredibly naïve and fundamentally flawed on several fronts.

To start – for a “rapid rollout” it is essential to have the technology developed to a stage that is can be rolled out – and that (from my extensive telecoms industry experience) usually takes a couple of years.

Secondly: it is absolutely essential to have a very large “economy of scale” so that production / purchasing is much less costly than small orders – and the large orders are put at the front of a production line – so those large scale infrastructure purchasers are several months ahead in delivery of those with small orders.

Thirdly, we have a chaotic situation in Australia with Telstra Corp. owning all the exchange sites, and conduits and service pits and lead-ins; and NBN Corp. utilising all these infrastructure components – and paying Telstra Corp. for the use of the infrastructure. This involves a huge amount of totally unnecessary work / rework and

it is horrendously inefficient – as we have had the TIO sitting in the middle settling well over 100,000 “inter-service complaints” per year! This should be ZERO!

It is the end user that has to pay a lot more than twice for all of this “competition is good” economic mess that is obviously fundamentally flawed - this is INFRASTRUCTURE which is **not** DISCRETIONARY. The wrong economic rules are being applied. We have immense totally unnecessary telecom infrastructure costs (including \$\$billions in totally unnecessary advertising / marketing / sponsoring / legal / and spurious sub-Government bodies (ACCC / ACMA / TIO / ACCAN etc.)). **“Privatisation Cost a Lot More than the NBN”**

Along with the pre-work as outlined above, it is imperative that the install / commissioning staff are very well trained / experienced – and you cannot get that by “importing” staff. The engineers and technical staff that are in-house trained and experienced (over decades) have a lot of invaluable in-house knowledge that enables rapid rollouts and very little down-time or rework. When it comes to having a “rapid rollout” this inherently means a lot of staff (e.g. 20,000 to 50,000) and a lot of overtime and that means a lot of project costs. All this makes an investment far from being profitable in terms of an ASX listed private sector discretionary competitive business and not meaning “profitable” for the Australian economy as a whole.

Commercially, investing in infrastructure is a long-term investment i.e. well over a decade before expecting any return on investment. From my experience entrepreneurs are looking for a solid ROI within two years – not two decades! With infrastructure projects where the entrepreneurs are looking for a (commercially quick) return on their investment – there are several “corners that are cut” – that lead to the fast demise of the infrastructure.

LM Ericsson (Sweden) already had almost 20 years close working relationship with the PMG / Telecom with the (Australian) manufacturing and rollout of Crossbar automatic telephone switch technology that was rolled out across Australia from CE 1960 through to about CE 1985 (that is 25 years). Part of this co-development was the Crossbar ARK switch technology that was very widely rolled out in all Regional areas. **“High Productivity of Crossbar Switching”**

When Telecom Australia moved on rolling out digital telephone call switching – that work started back in about CE 1975 where the Telecoms Research Labs were world leading with Plesiochronous Digital Hierarchy (PDH) transmission technology. **“Highly Economic PDH Transmission”**

Circa 1981 LM Ericsson chimed in with their AXE 101 PDH backhaul connected digital telephone exchange that used reed relays for a line concentrator as the digital conversion chips were very expensive. As innovations (not competition) enabled considerable reduction in chip production costs, Ericsson came out with the far more compact and economical AXE102 exchange technology and working collaboratively (i.e. in negative competition) with Telstra’s TRL, the AXE 104 digital telephone exchange became the new standard for Regional Australia until now, and that took about 15 years to roll out. **“Mighty Productivity of Digital Platforms”**

The concept of a “fast rollout” is fundamentally flawed because of the very nature of infrastructure being a very large scale project – it takes several years to roll out. With new telecoms technologies it typically takes about a three years to conceive, plan, and set up manufacturing and then about a decade (10 years) to install and commission into service at thousands of locations.

Way back in the mid CE 1980s, the Federal Government absolutely killed the possibility of rapid / fast and efficient rollout (and investment in new telecoms solutions) when they very foolishly privatised the Australian Telecom Commission.
“Privatisation Cost a Lot More than the NBN”

With the move to privatise the business focus in Telecom diametrically changed from being an Infrastructure Business - focused on maximising telecom services throughout Australia (obviously including the Regional Rural and Remote areas): to being a Competitive Business - focussed on maximising shareholder dividends and executive remuneration – primarily focussed on metro services at the extreme expense of telecoms services in the Regional Rural and Remote areas.

It took about 10 years (i.e. to about CE 1995) before it became painfully obvious that privatising this infrastructure was a fundamental flawed strategy that must be reversed – but the politicians in the Federal Governments have been, and are all far too compromised, to re-nationalise this telecoms infrastructure for the significant betterment of the Commonwealth of Australia (as could negatively impact on the ASX) – but it would also very positively impact on the productivity of all businesses and communities in Regional areas – which would positively impact on the ASX!
“The Privatisation Wheels Fell Off”

Instead of “pulling the pin” and re-nationalising Australia’s telecom infrastructure, successive Federal Governments have had a series of insipid Inquiries (over 15 since about CE 1998) with equally insipid Reports that get filed in rubbish bins and an occasional expensive “initiative” to that continues to aggravate the situation.

The phrasing “rapid rollout of and investment in new telecommunications solutions in regional areas” absolutely wrecks of underhanded political grants (of which the current Morrison Liberal Government is repetitively notorious). These grants are like political “band-aids” where multiple tourniquets would be a minimum fix.

The need for Grants is primarily because too many sub-Government Departments (Commissions) have been privatised (for personal greed) at immense cost to Australia’s economy and Government of the day are looking for “quick fixes” so that in the “long term” they are hopefully re-elected to further ruin the Australian common wealth (of infrastructures).

Circa 2017, I started to assist in the engineering design of a revolutionary highly economic distributed FTTHomestead project with TelSoft (trading as SmartFarmNet). The concept of this technology was something like I had considered back in about CE 2005 – but I had no synergy partners to build the concept to reality for building Australia’s Regional Rural farming / grazing Australia’s productivity.

It took about three months to transfer our combined network structure concept onto a virtual map and relate real manufactured SMOF cable parameters (available and practical SMOF cable lengths, number of fibres in different types of cables, advantages and disadvantages of different types of splicing boxes, what types of Small Form Profile (SFP) Gigabit Interface Converters (GBICs) along with tentative Switch / Router and Premises Fibre modem equipment and cut the options down to engineering practicality. Then we started to see how this network concept would fit in real life!

The first Regional area we considered was the semi-rural area of Bywong / Wamboin / Sutton about 10 km to 20 km NE of Canberra. This area has about 1200 “Homestead” premises on it and most premises had a high demand for excellent Broadband connectivity.

In mapping our distributed SMOF FTTH network technology to this area – it quickly became fairly obvious that our network design parameters had to be substantially changed. It could be done – but with a rather different distributed network density than we had first envisioned. This meant considerably more fibres in the SMOF cables than we had originally anticipated and the distributed Nodes would be substantially larger than we had anticipated.

This was a rather steep learning curve and our engineering was rapidly advancing – so we naturally involved the Wamboin / Bywong community and they welcomed the involvement as many of these people (we found out) were “tech heads” and with this distributed SMOF network infrastructure - they could have much faster than 100 Mb/s and work from their homes instead of travelling to and from Canberra etc.

We also (naturally) involved the Councils and they were highly appreciative that gigabit Broadband was about to be rolled out in their area. After all – who would get the credit – the Council! As it turned out, the community also involved the State Government – and through people they knew – they sought a Grant. After all – who would get the credit – the State Government!

It did not take that long for the wheels of corruption to work backwards and instead of supporting funding being directed to (TelSoft / SmartFarmNet) for the distributed SMOF Homestead Gigabit Broadband project – Grant funding from the NSW Government had somehow gone to the Wamboin / Bywong Community Committee – so after about 12 to 15 months of fundamental research and development we pulled the pin on this project and looked elsewhere.

In hindsight – this area would be far better served by running a SMOF cable through and selectively placing about six Fixed Wireless Radio Base Stations – and providing a couple of the larger businesses with FTTP on the way. The people there definitely did not want Fixed Wireless antenna showing on their roofs!

Another request came up near Busselton in WA and another in King Island in Tas. King Island showed lots of promise as this is a Regional Rural area about 24 km wide and about 64 km north to south - in the middle of Bass Strait. The co-sponsor of this wanted to provide 4G mobile connectivity all over the island – and use some of the spare fibres in our SMOF cables to provide backhaul connectivity for his proposed Radio Base Stations.

While I developed a tentative SMOF network to “grid” over the island I also checked on the possibility of existing SMOF to either / both Tasmania and Victoria – and there is none – and the underwater distances are about 92 km and 96 km respectively. The only communications connection is a

point-to-point (digital) radio between about Woolnorth (Tas) Stanley and Grassy (King Is) – and the seabed is not that deep.

For this project to be viable it would have to have two undersea SMOF cables (one from Apollo Bay Vic to Cape Wickham (north end of King Island) and another from Grassy (King Is) to about Woolnorth / Smithton (NW Tas) and have these interconnected from Melbourne / Hobart / Launceston. This project was stopped there as we simply do not have the “economy of scale” to make this happen!

More recently was again looked at the Region surrounding Walcha in NSW. We can do it - but Telstra does not have enough Broadband connectivity in the Regional NSW areas – so we have to had to radically change our network structure.

More recently we looked at the Region surrounding Wangaratta from the King Valley to Rutherford. We can do it - but Telstra does not have enough Broadband connectivity in the Regional Victorian areas – so we have to had to radically change our network structure.

More recently was again looked at the Region surrounding Boorowa / Young / Yass Harden in NSW. We can do it - but Telstra does not have enough Broadband connectivity in the Regional NSW areas – so we have to had to radically change our network structure, and hang it off a Vocus cable that is a secondary network issue.

All these network designs take several months to develop – and there is no return on investment of time and expertise.

Several other Regional Rural areas had been considered – but the NBN rollout of Fixed Wireless technology (instead of highly unsatisfactory Satellite technology) has to a large degree smothered many of these investment opportunities.

Currently, the Federal Government has the National Broadband Network Corporation (NBN Corp.) that is uncomfortably sitting under / beside / across from / adjacent to / whatever / . . . the Dept. of Communications and the Arts.

This Department can very simply far better facilitate the rapid rollout and investment in new telecommunications solutions in regional areas by restructuring the NBN Corp. as the NBN Commission under the Department.

The next strategic move is to transfer all the NBN all advertising and marketing out of the NBN Commission and transfer in from Telstra all the Regional Rural and Remote infrastructure into the NBN Commission. *Discuss with me.*

As far as I am aware, Telstra have done as little as possible to maintain and upgrade the DRCS/HCRC infrastructure in the Rural Remote areas – and has certainly not done any upgrading of the radio equipment to be capable of IP transmission.

With my extensive telecoms engineering background, I can see that such an upgrade of the HCRC radio equipment would be very inexpensive and straightforward, very quick and provide at least 350 Mb/s to over 1000 Mb/s reliable backhaul connectivity throughout the Regional Rural areas in Australia.

This inexpensive long-haul transmission initiative would then facilitate reliable IP connectivity for a range of Access Network technologies (including FTTP, FTTN, Fixed Wireless, 3G / 4G / 5G) for most of Regional Remote Australia. This strategy would very inexpensively facilitate about 2,000 Radio Base Stations in Regional Remote Australia and eliminate over about 4,000 Radio Black Spots out of 13,000.

I have another very inexpensive and highly practical strategy that would remove about 8,000 Radio Black Spots in Regional Rural Australia.

12. *How can different levels of Government, the telecommunications industry and regional communities better co-ordinate their efforts to improve telecommunications in regional Australia?*

This question was indisputably answered back in about CE 1999 with the dismally failed “Networking the Nation” initiative.

It is simply not the role of “different levels of Government, the telecommunications industry and regional communities better co-ordinate their efforts to improve telecommunications in regional Australia”!

This is the role of the Department of Telecommunications and the Arts, to 100% manage, and that is why I have stated above that the NBN Corp. must be immediately pulled in under the Department of Telecommunications and the Arts as the NBN Commission, so the Department manages the policies and the NBN Commission owns and manages the Regional telecoms infrastructure.

Refer to the answer for question 15 for more detail on what to do and how to do it!

13. *What changes to Government investment programs are required to ensure they continue to be effective in delivering improved telecommunications?*

The one change to Government investment program is that with the NBN Corp. Ne executive restructured to immediately be the NBN Commission sitting directly under the Dept. Telecoms and Arts, is that all funding then comes from the Federal Reserve that is managed by the Treasury.

This slight restructuring is very simple, straightforward and ensures that the NBN Commission will be appropriately funded (directly from the Federal Government - and not via “Grants”) to provide significantly improved telecoms infrastructure in the Regional areas – particularly Regional Remote areas.

Telecoms infrastructure is an essential service - therefore no advertising / marketing / sponsoring is required. That funding needs to go directly into Regional telecoms infrastructure.

14. How can regional consumers be better supported to identify, choose and use the best connectivity options for their circumstances, as well as to understand and use their consumer rights?

With the NBN Commission in place, properly and professionally managing the all the telecoms infrastructure in Australia's Regional areas, there is absolutely zero need for regional consumers to "identify, choose and use the best connectivity options" as these connectivity options will as a matter of course, be the best available telecoms connectivity options for all people, communities and businesses in the Regional areas. Refer to the answer for question 15a for clarification.

Also the "consumer rights issues" brought up by the stupidity of having "competition in infrastructure" will be obliterated because it is in the best interests in any "Infrastructure Business" to maximise service standards. As such, the NBN Commission would (naturally) be chartered to do just this, and continually / proactively upgrade the service standards wherever and whenever possible to be well above all consumers needs.

15a. To what extent is public information on connectivity options, including predictive coverage data and speeds, sufficient to help regional customers make informed decisions?

In my professional opinion, the concept of this question is fundamentally flawed as the (Internet) network connectivity options (including the ones mentioned in the question) should be sufficiently above the needs for Regional customers so that they always will have reliable, fast, low latency Broadband as a matter of course – and they do not have to make any "informed decisions" for Customer – Small Business applications.

Considering that most Home / Small Business Local Area Networks operate at 1000 Mb/s with very low latency, the minimum Service Quality specification for Regional Customers Broadband Access Network connectivity should be the following:

Downstream Speed:	=> 100 Mb/s (typical 1 Gb/s)
Upstream Speed	=> 100 Mb/s (typical 1 Gb/s)
Ping/ Delay	=< 35 msec.
Robustness / Dropout	=< 30 seconds per year
	=> 99.9999 % reliability
Node Contention / Congestion	=< 2% at any time
Data Budget	=> 100 GBytes /month

If the Access / Node / Backhaul technology cannot provide this connectivity minimum standard then those technologies must be replaced by appropriate Broadband technologies.

15b. What other information is needed to help regional customers make informed decisions?

The above specifications should provide virtually all Regional Customers with a Broadband connectivity that is reasonable for most applications leaving very little reason for "other needed information".

16a. What other matters should the Committee consider in its review?

A total restructure of the entire telecoms infrastructure ownership and “shareholding” together with a clear focus on “economy of scale” in Regional areas to be totally owned and operated by a Commission under the Dept. Communications and the Arts, the transferring of all Regional Telecoms infrastructure from Telstra Corp. (and other Service Providers / Carriers, including NBN Corp. and Infra Corp., and Vocus / Macquarie, and TPG / Vodafone and AARNet Corp. etc.) and the transfer into Telstra (Metro) Commission from Optus, TPG, NBN Corp. and other “competing” Mobile Device Service Providers.

This will free up thousands of under-utilised 3G / 4G / 5G Radio Base Stations / antennae masts in Metro areas and have these transferred to Regional sites – to wipe out the “Radio Black Spots” debacle. (*Discuss this with me.*)

16b. Why are these other matters important?

Expanding Australia’s Regional productivity is far more important for Australia than having the gross inefficiency of competing telecoms corporations severely over-providing essential infrastructure in Metro areas while severely underproviding essential telecoms infrastructure in the Regional areas.

By removing this “competition” the massive overhead costs of advertising, marketing and sponsoring and legal, and loss of “economy of scale” will be removed from customer bills – so the end user / customer costs will be really driven down, and service performance will significantly increase – particularly in Regional areas.

Similarly – this infrastructure when set up properly will become entirely self-managing and will internally strive for continued improvement (as it did before being privatised) and as such will have its own internal accounting and reporting to proactively identify and maximised service standards irrespective of physical location.

This (residual from commercial advertising etc.) funding will then otherwise be wisely invested in rebuilding the reliable and robust Broadband telecoms network that Regional Australia desperately needs to grow the Australian economy.

As such external bodies such as the ACCC etc. can focus their business on ensuring that competitive businesses that provide discretionary products and services (i.e. fashion shops etc.) follow the economic guidelines of discretionary economics.

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[REDACTED]