Chapter Four

To bury or not to bury…

4.1 In rolling out fibre-optic cable to 90 per cent of Australian homes, workplaces and schools, there are two main choices for the mode of deployment: underground cabling and aerial cabling. The committee strongly believes that this issue requires greater scrutiny by the government, industry and the Australian people; consequently this chapter is dedicated to this crucial issue.

Aerial

4.2 To provide optical fibre cables aerially, the NBN Co will need to either use existing electricity utility infrastructure, or to build their own poles where there are none in existence. Aerial cabling is most likely to be used in existing, or 'brownfield' areas, where telecommunications and other infrastructure already exists. Extrapolating from that assumption, and taking guidance from the Tasmanian roll-out, the committee believes that aerial cabling may be deployed over the vast majority of the 90 per cent FTTP footprint.

Deployment requirements and issues

4.3 To the casual observer, the option of utilising existing power poles to carry the fibre optic cabling required for the FTTP project seems an obvious and efficient solution. The infrastructure is already there, so all that might be required would be the technical slicing and stringing of cables between poles to connect each premises.

tasCOLT pilot

4.4 This was the assumption made during the planning of the tasCOLT pilot that connected several small pockets of homes in Tasmania to a FTTP network utilising existing infrastructure. The pilot objectives were to create a FTTP network using Passive Optical network technology, deployed mainly via overhead cables owned by Aurora Energy, and delivering network services capable of average speeds up to 100Mbps. The completed tasCOLT network passes approximately 1200 premises, connecting approximately 600 of those. Over half of the connected premises have subscribed to the full range of services available under the project. [1]

4.5 However, the final report of the tasCOLT project provides evidence that aerial cabling was not the quick-fix that planners had anticipated. The rollout of the pilot was expected to take six months, but actually took almost two years, with the report

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1 *Report on the rollout of the tasCOLT Fibre to the premises Commercial Trial October 2008,* pp 3-5.

noting that 'installing optic fibre in "brownfield" areas is complex.'[2] The reported reasons for the massive overrun on the project timeframe were:

- The requirement to obtain local government approvals for aerial cable deployment, including an environmental impact study and approvals from the Tasmanian Heritage Council, where applicable;
- The integration of the optical fibre system with Aurora Energy's existing infrastructure, which involved:
  - compliance with OH&S standards;
  - compliance with Australian Engineering standards;
  - possible reconfiguration of existing poles and cabling; and
  - possible replacement of some poles and cabling.
- The availability and affordability of skilled installation contractors;
- The requirement of approvals from landlords to connect the drop cable to each property.[3]

4.6 In a revealing admission, the report made the statement that:

> Local government is a key player in the deployment of optic fibre networks and should be included as a partner in any project.[4]

General aerial issues

4.7 The documented lessons from the tasCOLT project validate the concerns expressed by several witnesses in relation to the use of aerial cabling. Mr Peter Downey, Chairman of Cables Downunder, gave evidence and also provided a written submission jointly with Dr Ross Kelso elaborating on several of the issues identified in the tasCOLT report.

4.8 When discussing the impact of aerial construction, the submission noted that electrical safety codes require power lines and optical fibre cables to be at separated, predetermined and standardised heights. An example of the impact of these codes from tasCOLT is illustrated at figure 2, with a photo of a typical pole at figure 3. The submission states that cable heights must also comply with road traffic regulations, with the lowest cable being no less than five metres above the crown of the road.[5]

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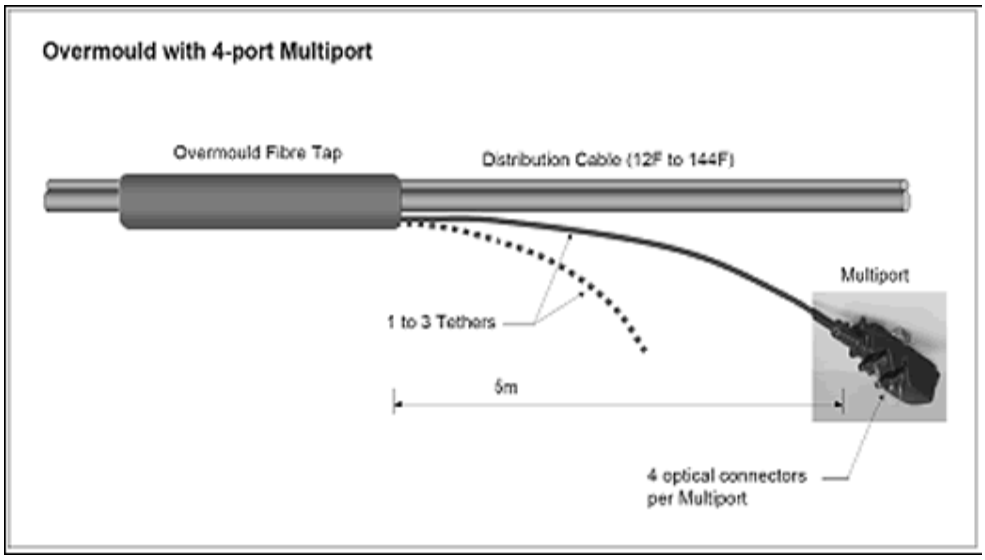
2 *Report on the rollout of the tasCOLT Fibre to the premises Commercial Trial October 2008,* p. 20.

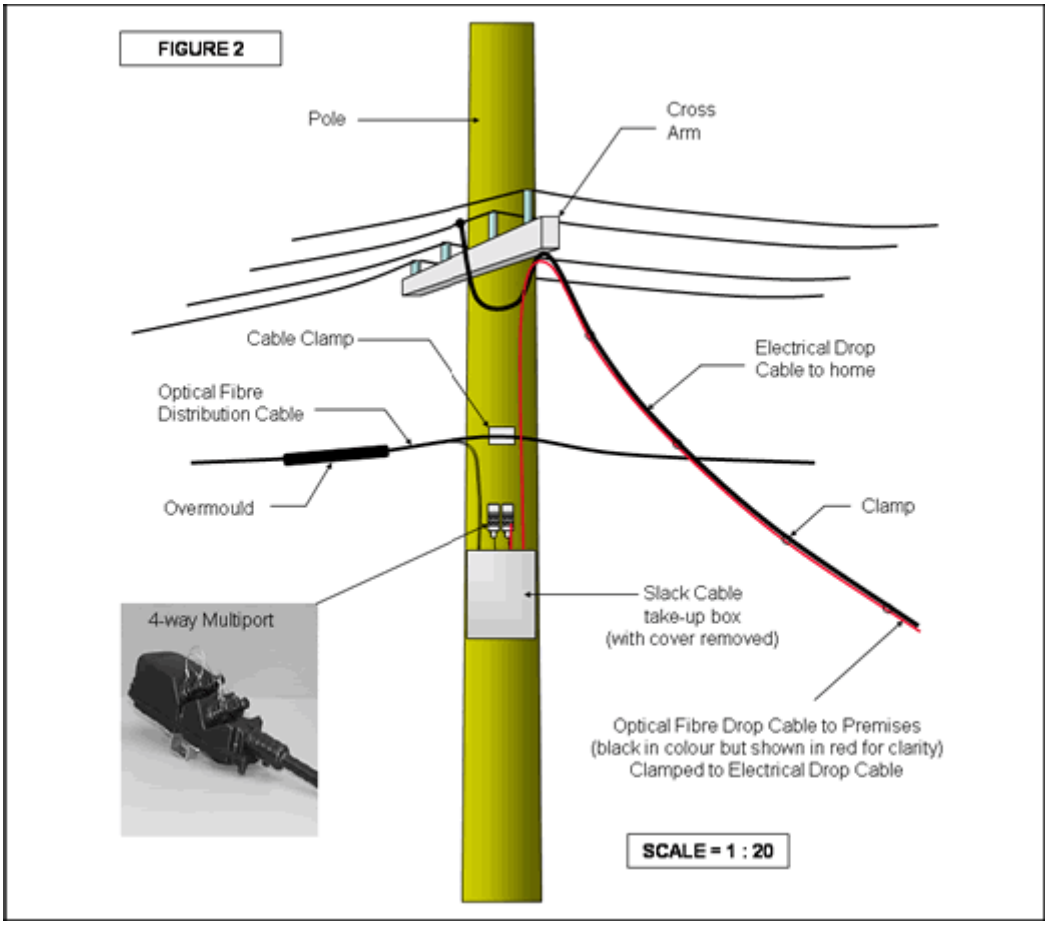
3 *Report on the rollout of the tasCOLT Fibre to the premises Commercial Trial October 2008,* p. 19.

4 *Report on the rollout of the tasCOLT Fibre to the premises Commercial Trial October 2008,* p. 20.

5 Kelso and Downey, *Submission* 94, p. 4.

Figure 2: Representation of aerial cabling[6]





6 *Report on the rollout of the tasCOLT Fibre to the premises Commercial Trial October 2008*, p. 13.

4.9 The submission states that during the Hybrid Fibre Coaxial (HFC) deployment by Telstra and Optus between 1995 and 1997, utilities companies determined that existing pole infrastructure was insufficient, and that existing poles had to be replaced or strengthened. The photo at Figure 3 illustrates efforts to strengthen and heighten a pole in a Brisbane suburb. Mr Downey explained that height clearance issues are exacerbated in hilly, or even mildly sloping, street scapes.

4.10 Mr Downey gave evidence that by deploying aerial cables Australia would be putting itself further behind international efforts, where 'the majority of communications and electricity cables are underground.'

> As an example, Germany began burying telegraph cables in 1845, London began burying electricity cables in 1882, followed by New York in 1888. We have found that many third world countries, such as Rwanda and Somalia in Africa, have underground fibre optic and electricity networks. Today UK is 85 per cent underground and Europe is 70 per cent and rising.[7]

4.11 Mr Downey also noted the lack of public awareness that aerial cabling is likely to be the mode of the NBN's deployment in many urban areas.

> At this stage I do not believe that the general public are aware that the NBN will be erected overhead. At various functions I have attended recently at which I have raised the issue there has been stunned silence followed by comments such as, 'You are kidding, aren't you?' …
>
> It does not matter what size the overhead cable is, it will be the fact that it is an overhead cable that raises the ire of the public.[8]

4.12 Even if aerial cabling is proven to be more efficient than underground cabling to deploy, there are legacy issues with aerial cabling that will remain a burden to governments for the life of the aerial cabling. One obvious cost is in keeping trees trimmed and well away from aerial cabling. The subsequent 'mutilation' of trees will continue to increase the visual pollution of aerial cabling, in addition to the annual cost of labour to prune the trees.

4.13 A further bottleneck that was caused by the use of aerial cabling in the tasCOLT project was the lack of skilled technicians. In order to rollout aerial cabling, technicians with electrical, communications and fibre optic slicing skills are needed.[9] If the government wishes to pursue aerial cabling, it will need to address this issue immediately and ensure that the additional time of training is factored in – as was clearly illustrated during the tasCOLT pilot.

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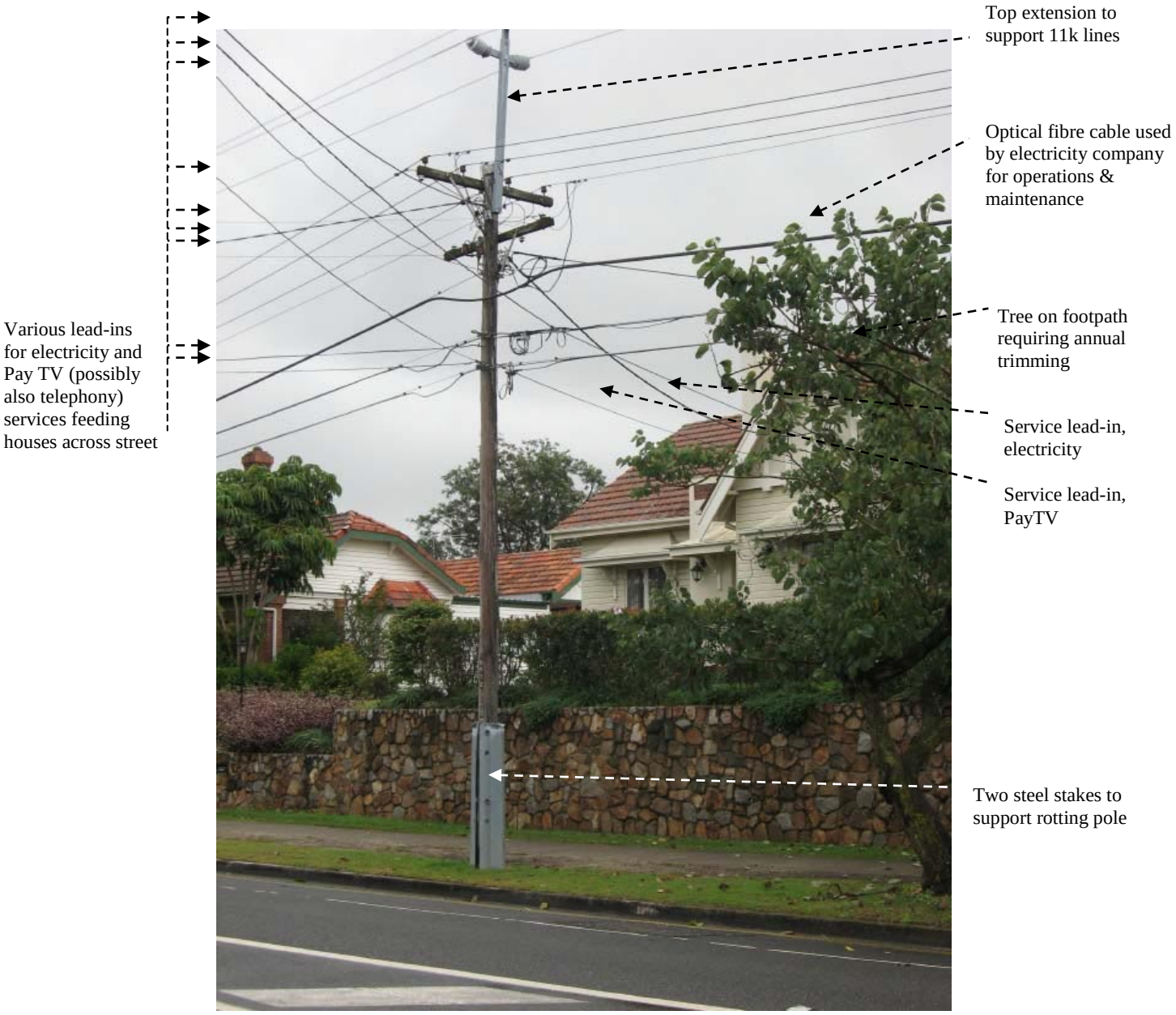
7 Mr Peter Downey, *Committee Hansard*, Canberra, 1 October 2009, pp 29-30.

8 Mr Downey, *Committee Hansard*, Canberra, 1 October 2009, p. 30.

9 See discussion, Mr Downey, *Committee Hansard*, Canberra, 1 October 2009, p. 31.

Figure 3: Visual impact of aerial cabling with required spacing[10]

Typical example of a pole that has been extended and strengthened to support additional HFC cables.



Picture taken by Ross Kelso

4.14 There is also a concern that aerial construction of the NBN 'will seriously degrade service reliability.'[11] Despite all efforts to keep power lines free from

10 Kelso and Downey, *Submission* 94, p.9.

11 Kelso and Downey, *Submission* 94, p.8.

obstructions, power lines and aerial optical cables are frequently brought down by severe storm conditions across the nation – again with ongoing repair costs.

4.15 For example, Mr Downey pointed to the threat to service reliability caused by bushfires every year across Australia. This was most evident in the tragic Victorian bushfires in February 2009:

> Many Victorian communities were put at risk simple because the overhead cabling that provided them with communications and power was destroyed long before those communities were aware of their peril.[12]

4.16 Conversely, the protection offered by below-ground infrastructure which escaped destruction was discussed by Mr Brad Wynter from the City of Whittlesea, which was devastated in those fires. Whittlesea council had been proactive in planning the installation of fibre conduits in greenfields estates. When asked whether underground services in the town had been any better off than the aerial cabling, Mr Wynter replied:

> Without a doubt, the underground infrastructure was preserved. At Strathewen, which is a neighbouring municipality, the only infrastructure that was damaged was the exchange, the above-ground infrastructure. In that case, Telstra brought in a portable exchange on the back of a truck and basically connected that up and had those services operating within one day.[13]

4.17 A further negative aspect of aerial cabling is the damage caused by traffic accidents between vehicles and power poles, both to surrounding businesses as a result of interruptions in communications and electricity services, and more importantly to individual health and life. There is also of course the cost of repairing both the pole and the cabling.

Underground

The technology

4.18 Underground cabling (undergrounding) is a more labour-intensive option for deploying the FTTP network. High labour costs consequently increases in the cost of deployment. Undergrounding costs are minimised in greenfield estates, where the cabling ground works can be undertaken as part of establishing the overall infrastructure of the greenfield area. This also minimises the impact of trenching on traffic, businesses and utility services to the community, as it can be completed prior to the area being populated.

4.19 Retrofitting of underground cabling is much more costly than greenfields undergrounding, due to the need to trench along and subsequently repair roads and

12 Mr Downey, *Committee Hansard,* Canberra, 1 October 2009, p. 30

13 Mr Brad Wynter, *Committee Hansard,* Melbourne, 7 October 2009, p. 91.

footpaths, in close proximity to existing underground infrastructure. In highly built-up areas there is the requirement of using horizontal trenching methods to minimise road closures and traffic disruption.

Tasmanian example

4.20 The Tasmanian government imported from Germany the latest in trench-digging machinery for laying fibre optic cables. This machinery was used in Hobart, which was the first time it had been used in Australia. The giant wheel-saw can cut through road surfaces with minimal disruption to traffic and minimal damage to existing road or footpaths.

4.21 The details of this new horizontal trenching technology were discussed by several witnesses. For example, Mr Downey explained that the technology is capable of 'trenchless' deployment of underground cables. By using a horizontal boring head with imbedded sonar detection, Mr Downey explained that:

> …you basically dig a hole two foot by three foot … at your entry point and then put another at your exit point and you just drill a [horizontal] hole underground.[14]

4.22 Mr Downey went on to explain that a worker with a sonar wand walks along the street, able to detect where the boring head is, and hence steers the head to avoid other underground infrastructure. This technique can be employed to lay cable under a busy intersection, avoiding any traffic disruption. Although understandably more expensive that trenching, this could minimise the disruption to businesses that would otherwise occur during the trenching works, also allow the continuity of other utility and communication services.

Improvement in planning coordination

4.23 The need for planning and consultation at the local government level is crucial for the deployment of underground cabling in both greenfield and brownfield estates. Issues that require consideration for greenfields were outlined by Mr Wynter from the Whittlesea Council at the Melbourne hearing.

4.24 The Whittlesea Council identified that the future retrofitting of fibre in greenfield estates would be very difficult, as all infrastructure is underground. The Council recognised that it could address this in future greenfields development planning by mandating that an additional conduit be laid for the future provision of fibre to the premises. As the council did not have a carrier's licence, and consequently could not lay the fibre themselves, they lobbied developers to provide a subsidy for licensed carriers who wanted to lay the fibre. The council now has two estates that are FFTP connected and providing 100Mbps services.[15]

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14 Mr Downey, *Committee Hansard*, Canberra, 1 October 2009, p. 37.

15 See discussion, Mr Wynter, *Committee Hansard*, Melbourne, 7 October 2009, pp 87-88.

4.25 Commenting on the cost saving of laying conduit at the time of development, Mr Wynter said that:

> We know that the cost of putting the conduits in at the time of subdivision is about half the cost of doing retrospectively – the main reason being that [developers] open up the trenches to put in all the other services, but to retrofit they have to bore under roads and footpaths …[16]

4.26 The benefits of laying conduit at the time of development were also highlighted to the committee by Professor Walter Green, and are detailed in the committee's first Interim Report. Professor Green not only outlined the economic efficiencies, but also highlighted the crucial need for improved coordination of infrastructure planning across all tiers of government and the private sector developers. In fact, Professor Green seemed to pre-empt the government's thinking when he stated that:

> State and Federal governments should in fact be mandating, for new estates or greenfield estates, that provision for the fibre infrastructure should be made.[17]

4.27 Professor Green was also able to provide the committee with examples where improved coordination between governments and developers had provided improved outcomes in major state infrastructure projects, including the recently completed Perth to Mandurah railway:

> …[W]here state planning has…been lucky is in terms of the Perth to Mandurah railway line. I…proposed…or motivated to get the conduit next to the railway line. Putting fibre in there is having an impact on broadband…[18]

Lack of standards and regulation

4.28 A critical issue raised by Mr Wynter was the lack of applicable standards for underground networks:

> We had some work done in getting a commercial developer to develop some standards so that the conduit would be suitable for any type of fibre technology, because there is a range of fibre technology, some of which require more space than others, and we built some standards around that conduit network to ensure it could be future-proof and could cater for any type of technology.[19]

4.29 The committee is concerned by this lack of standardised practice, and urges the government to bring forward the development of standards that would be

16 Mr Wynter, *Committee Hansard*, Melbourne, 7 October 2009, p.89.

17 Professor Walter Green, *Committee Hansard*, Perth, 6 November 2008, p. 56.

18 Professor Green, *Committee Hansard*, Perth, 6 November 2008, p. 56

19 Mr Wynter, *Committee Hansard*, Melbourne, 7 October 2009, pp 87-88.

applicable nationally to greenfields conduit networking. The committee notes that although there are various current standards for the retrofitting of aerial cabling, the government needs to ensure there are national standards for the retrofitting of underground cabling.

4.30 Mr Wynter also noted the lack of regulation at the federal level, which became evident when the Whittlesea Council came to enter into agreements with carriers to ensure they provided FTTP services on an open access basis:

> The conduit belongs to council, and it is our mechanism of ensuring that we get our three policy objectives met … open access, scaleable infrastructure and a rich mix of services on a competitive basis. ... Currently, because there is no regulation at the federal level, we are the ones that have to regulate the open access, and [retaining ownership of the conduit] is our mechanism for doing so.[20]

Comparative advantages and disadvantages

4.31 It is apparent that the government is desperate to demonstrate progress on the NBN, particularly with the commencement of an election year in 2010. The Committee is concerned that the Government is looking to implement aerial cabling in as large an area as quickly as possible to serve this need.

4.32 Despite the government refusing to release the full report of the Panel of Experts, their negotiations with the Tasmanian Government were a clear indication that the Expert Panel thought there was merit in the Tasmanian Government bid for the FTTN RFP process. This bid no doubt would have aimed to leverage the experience and lessons gained during the tasCOLT pilots, the majority of which involved retrofitting aerial cabling in brownfield estates.

Aerial advantages

4.33 The main advantage of deploying aerial cabling is in the apparent time-saving use of existing infrastructure. However, as evidenced by the experience of the tasCOLT pilots, this anticipated expediency did not eventuate

4.34 If aerial deployment is effectively planned to ensure the required approvals and skill shortages do not cause bottlenecks, aerial cabling may be more cost effective. This in turn could enable the NBN Co to more quickly become commercially viable. However, the ongoing maintenance and repair costs would be a continual burden for the operator.

Underground benefits

4.35 The benefits of underground cabling are numerous and long term, as has been outlined above. These benefits include:

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20 Mr Wynter, *Committee Hansard*, Melbourne, 7 October 2009, p.91.

- underground cabling is a future proofed, long term solution;
- immediate economic stimulus of increased employment across a broader section of local communities;
- lack of visual pollution;
- consequential increase in property values;
- lack of impact from climatic extremes, including bushfires and flooding;
- consequential increased reliability;
- decreased maintenance costs;
- decreased associated costs of pole replacements (due to motor vehicle accidents);
- no need for street tree mutilation;
- decreased OH&S issues;
- decreased electrical transmission losses with consequential decrease in greenhouse gas emissions[21];
- smart deployment technologies will enable skills development while minimising disruption to telecommunication and utility services; and
- decreased negative impact on local businesses during deployment.

4.36 Deploying the NBN fibre optical cables underground will result in a long term, future proofed solution. Initial increased deployment cost and time frames can be mitigated by the overall decrease in ongoing costs over the life of the fibre. This will provide a pathway for the long term commercial viability of the network.

4.37 Cables Downunder went further in their submission to advocate that the government should utilise the NBN opportunity to embark on burying all aerial utility infrastructure as a long term, truly nation building project.[22] The submission quoted a comprehensive study undertaken around 1998 'into the practical options for retrospectively undergrounding both aerial electricity lines and telecommunication cables throughout urban and suburban Australia.'[23]

4.38 Included in the study were all urban and suburban localities with a population over 30,000, which then equated to around 90 per cent of the population. The average cost of retrofitting underground utilities was then estimated at $5516 per household. However, with today's innovative design, installation improvements and economies of

21 See discussion Kelso and Downey, *Submission* 94, p.7.

22 Kelso and Downey, *Submission* 94, p.8.

23 Kelso and Downey, *Submission* 94, p.6.

scale, the submission states that figure could be closer to $4900 per household in today's figures.[24]

Dearth of information

4.39 The committee is concerned at the dearth of current information relating to comparative costs of aerial versus underground deployment of the NBN, despite the best efforts by the committee to source that information. Witnesses generally pointed to the companies manufacturing and/or deploying fibre currently as the logical source of that information.

4.40 However, when the committee sought that information from Aurora Energy, the partner in the NBN Tasmania venture, the major infrastructure supplier and owner refused to reveal likely costs. They instead referred the committee's question to the NBN Tasmania. The response was eventually provided was completely unhelpful, devoid of any dollar value, noting only that:

> In general terms installing optical fibre cable on overhead structures is substantially cheaper than installing the same infrastructure in a new underground environment.[25]

4.41 The committee also highlights that tender documents released by Aurora Energy for the Tasmanian roll-out confirm that 560km of the 580km of cable will be aerial. This is with little consultation with the general community that will be impacted by the aerial cabling, nor with the local councils in which the roll-out is to occur.

Committee view

4.42 The committee remains concerned that the perceived short term benefits of aerial deployment will over-ride sound business practices, which should dictate that major national infrastructure is built seeking long term benefits.

4.43 The committee strongly cautions against expediency where it would clearly not be in the long term interest of public investment. The short term cost efficiency gains that may result in short term political benefits need to be weighed against the long term efficiencies of underground cabling. As submitted by Cables Downunder:

> It would be foolish to embark on a nation-building exercise based on such a short term approach to construction cost and roll-out speed.[26]

4.44 Additionally, as can be seen in the previous photograph, the outcome is far from ideal, and is certainly not 'future-proofed'. Australia is already more than a

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24 Kelso and Downey, *Submission* 94, p.7.

25 Answers to Written Questions on Notice, NBN Tasmania Ltd, Question 3, 10 November 2009.

26 Kelso and Downey, *Submission* 94, p.6.

century behind major international competitors that have buried the vast majority of their electricity and telecommunications cables.

4.45 The committee highlights that the aerial deployment of the NBN merely provides a quick-fix, bandaid solution that is not worthy of an infrastructure project of this magnitude.

4.46 The committee therefore urges the government to favour underground cabling in the remainder of the 90 per cent FTTP footprint, ensuring long term, future proof benefits for the network, its investors and its consumers.