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Submission on Aerial Cabling and the National Broadband Network Roll-out

Authors: Dr Ross Kelso and Peter Downey

Synopsis

Aerial construction of the access network component of the National Broadband Network is totally incompatible with any pretence of constituting a nation-building investment; furthermore, it will seriously degrade the reliability of a broadband service that is proclaimed to underpin Australia's future digital economy.

A truly nation-building alternative would be to underground all aerial utility construction, bundling the NBN along with undergrounded electricity distribution lines.

Relevance to Senate Select Committee Terms of Reference (as revised)

This submission addresses items 1(b)(i) "...implications of the NBN for consumers and taxpayers in terms of service availability…"; 1(b)(iii)2(d) "…implications of the NBN for consumers and taxpayers in terms of likely consequences for … social capital" and 2(i)(e) "…the appropriate public policy goals for communications in Australia and the nature of any necessary regulatory settings…".

Previous Interactions with this Senate Select Committee

A previous submission by Dr Kelso is listed as No. 24 at http://www.aph.gov.au/Senate/committee/broadband_ctte/submissions/sublist.htm . He appeared before the Committee in Brisbane on 21 November 2008 and in Sydney on 3 March 2009. The matter of aerial cabling[1] was not raised on any of those occasions as by then it had not formed part of announced government policy relating to roll-out of a National Broadband Network (NBN).

About the Authors

Dr Ross Kelso

Dr Kelso's professional background includes over 30 years as an engineer and manager in the telecommunications industry, followed by over 10 years as an independent researcher and consultant covering a diverse range of fields from telecommunications strategy, policy and regulation to the social and economic aspects of information and communication technology and services.[2]

[1] This submission refers to such cabling as 'aerial'; an alternative description is 'overhead'.

[2] In 2008, he completed doctoral studies at Queensland University of Technology that focussed on the following research question: What are the factors that prevent open access to the broadband services of next generation wireline infrastructure? How can these obstacles be overcome? A full copy of his doctoral thesis can be downloaded at http://www.rosskelso.com or via http://adt.library.qut.edu.au/adt-qut/public/adt-QUT20080624.153258/ .

Until 1995, he was Telstra's manager for technology and regulatory aspects of what was to become the delivery network for Foxtel's pay television and Telstra's cable broadband service.[3] From 1996 until 1999, he was in the unique position of working for local government, specifically employed by the Banyule City Council (Victoria) as well as consulting to the Australian Local Government Association and to various other local governments in Victoria, New South Wales, South Australia and Tasmania, solely concerned with the adverse impact of the aerial cabling roll-outs by Optus and Telstra. He specifically explored opportunities for retrospectively undergrounding both electricity lines and telecommunications cables.

Dr Kelso successfully lobbied on behalf of local government for major changes to the Telecommunications Act and associated Codes for reduction of carrier powers and immunities[4] and provided expert advice to the Putting Cables Underground Working Group, established by the Department of Communications and the Arts in response to community outrage over the cavalier approaches of Optus and Telstra towards aerial cabling. Through a report to Whittlesea City Council "Strategic Planning of Telecommunications Infrastructure and Services for New Estates" in September 2000, he contributed to groundbreaking moves in Victoria for local government to encourage competitive service provision of underground cable-delivered broadband services in new housing and business estates.

Peter Downey

Peter grew up in the Sydney suburb of Drummoyne and left school at sixteen to take up an engineering apprenticeship which was followed by further studies in Engineering and Sales. During those early years as an apprentice he supplemented his income by working for some local radio and television shops installing and repairing domestic and industrial electronic equipment. During the 1980's, Peter became the CEO of a medium sized business manufacturing and wholesaling components and equipment for the Blind Industry.

Later in that decade, he was asked to undertake tasks as a corporate doctor reorganizing company structures and performance. This was followed by project managing a number of large projects in the motor vehicle manufacturing and Defence areas.

In 1996, Peter was elected as Chair of Sydney Cables Downunder – a group of concerned citizens and Councils opposed to the outmoded technology used in the pay television roll-out.[5] While this protest was initially founded on aesthetic principles, Peter used his engineering background to research the design and construction of electricity and telecommunications infrastructure. He was disappointed to learn that not only were Australia and particularly NSW lagging behind the rest of the world but that aerial/overhead networks brought with them

[3] To place events in a timeline context, the hybrid fibre-coaxial (HFC) cable roll-outs by Optus and Telstra ran from late 1995 until late 1997.
[4] This included Australian Local Government Association Submission on the Review of the Telecommunications (Low Impact Facilities) Determination 1997, February 1999, co-authored with Heather Neil of the ALGA.
[5] The group is now known as 'Cables Downunder'.

tangible financial and reliability problems. These disadvantages continue to not only adversely affect the electricity service tariff and quality for both industrial users and residential consumers, but also degrade the long-term economic performance of Australia.

Relevance of Aerial Cabling to the Current Debate

The DBCDE Discussion Paper "National Broadband Network: Regulatory Reform for 21st Century Broadband"[6] suggested in Chapter 2 that at least some of the proposed NBN will employ aerial construction to reduce roll-out costs and raised the prospect of amending relevant legislation to facilitate this.

Among other statements on the matter, Senator Conroy stated on 16 June 2009:[7]

> … the government wants the rollout to be as unobtrusive as possible. Where possible and where it is cost effective, fibre optics can and will be placed underground. In other instances, aerial cabling may be faster and more cost effective. Where necessary to facilitate the rollout of fibre optics, the government is prepared to amend the existing carrier powers and immunities.

Background

Schedule 3 of the Telecommunications Act 1997 provides carriers with the power to inspect land to determine whether the land is suitable for the carriers' purposes, to install a facility on the land and to maintain a facility that is situated on the land. The power to install a facility may only be exercised with respect to certain types of infrastructure, such as a facility defined in the Ministerial Telecommunications (Low-impact facilities) Determination 1997 or a temporary defence facility, or if the carrier holds a Facility Installation Permit which is obtainable from the Australian Communications and Media Authority (ACMA).

The Telecommunications (Low-impact facilities) Determination 1997 specifically states that aerial cables are not of 'low impact' and hence carriers wishing to deploy cables aerially must seek planning approval from state, territory and/or local governments. This requirement was specifically introduced in response to significant concern among communities and local governments after Optus and Telstra rolled out substantial hybrid fibre-coaxial (HFC) cable networks between 1995 and 1997 for delivering pay television and broadband services, without community consultation and without consideration of the impact of the cables on the local environment. The Optus and Telstra roll-outs were terminated before the Determination came into effect.

In 1998, the then Minister for Communications authorised the Department to obtain a report from the *Putting Cables Underground Working Group* (PCUWG) concerning

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[6] Refer to http://www.dbcde.gov.au/communications/national_broadband_network/regulatory_reform_for_21st_century_broadband

[7] Senate Official Hansard (No. 6, 2009) for Tuesday 16 June 2009 at page 3315. http://www.aph.gov.au/hansard/senate/dailys/ds160609.pdf

options for undergrounding all aerial telecommunications cables and electricity lines throughout urban and suburban Australia.

Discussion Relevant to the NBN

Two significant issues arise from these considerations: what will be the likely impact of the National Broadband Network being installed aerially; and can lessons from the past guide the federal government to instead adopt a truly inspirational vision for the nation?

Impact of Aerial Construction

Throughout mainland capital cities and the Gold Coast, electricity poles that supported 415 volt lines (and often also 11 kilovolt lines) have since 1995/97 been required to additionally support one or two HFC networks as well as customer lead-ins for electricity, telephony and pay television. Figures 1 and 2 depict this common occurrence – which in this instance happens to be in the Prime Minister's electorate of Griffith.

Electrical safety codes require that the upper pay television cable is suspended a certain minimum distance below the 415 volt lines, and then the lower cable is attached a further distance[8] lower down each pole. All cables (and lines) naturally sag in a catenary fashion such that the lowest point occurs mid-span. Road traffic regulations require that this mid-span clearance of the lowest cable above the crown of the road must be no less than about 5 metres. Where this clearance is inadequate, the cable gets snagged by high road vehicles resulting in broken cables, broken lines and interruption to electricity and communication services.

Maintaining the necessary minimum clearance becomes more difficult when the road slopes longitudinally or laterally (i.e. one side is higher than the other). At road junctions, as seen in Figure 2, the clearance problem may be further exacerbated due to the extra number of cables converging at one location and allowance for street lights. Lead-ins to homes present a clearance problem for extra aerial cables, particularly when they pass over driveways (including those of neighbouring properties) and more so when the house is on the low side of a road and the electricity poles are on the opposite and higher side. High vehicles such as furniture removal vans accessing properties and Council garbage trucks are more likely to collect the lowest hanging cable.

When faced with demands by Optus and Telstra to attach their pay television cables to electricity poles, the electricity distribution companies immediately determined that the strength and height of certain poles was insufficient. Accordingly, many poles had to be replaced, strengthened or heightened – thereby perpetuating an already outdated form of essential infrastructure. Figure 1 appears to reflect this latter approach by extending the pole height to elevate the 11 kilovolt lines and so ensuring adequate clearance for the extra cables below.

[8] Probably not related to safety, but rather more the practicality of allowing access for the 'cable spinner/lasher' device to deploy the second cable.

The clearance problem is starkly illustrated by the typical Australian residential street with footpath trees only on the side opposite the electricity pole route or, as in Figure 3, with trees under the pole route mutilated.

All state road traffic and safety authorities are well aware of the regular occurrence of electricity poles being hit by vehicles, with electricity lines being brought down or even the poles being destroyed. Figure 4 graphically depicts an all too common example. In addition, severe storms regularly bring down trees on top of electricity lines and any telecommunications cables – particularly in rural areas and in the more tropical parts of Australia. The recent Victorian bushfires dramatically illustrated the vulnerability of all above-ground infrastructure, whether electricity or telecommunications, and conversely the protection offered by below-ground infrastructure which escaped destruction.

If access cabling for the NBN is installed aerially along local roads, it will cause electricity poles to be unnecessarily upgraded, worsen the visual environment, reduce the clearance above road and driveway levels, and totally negate any remaining opportunity to retrospectively underground aerial cables and lines throughout Australia. Of greatest significance however, every length of NBN aerial cabling shared by a number of customers will inevitably result in reduced service reliability for those customers due to the increased likelihood of the cable being damaged by high vehicles, falling trees, bush fires or the supporting poles being hit by errant vehicles. Such causes of service unreliability remain regardless of whether the optical fibre cable deployed with the NBN is of smaller diameter than that of the previous installed HFC networks.[9]

This prognosis applies where any NBN aerial cabling is the first non-electricity asset to be pole-attached and is even more applicable where one or two HFC pay television cables are pre-existing, thereby forcing the NBN cable into the lowest position.

Not only will NBN access cabling suffer degraded service reliability in its own right once aerially constructed, no broadband service is possible without reliable electricity. With both NBN and electricity services supported on the same pole route, the incidence of outages is further magnified.

It has been claimed that as the optical fibre cable contains no metal then the electrical safety problems go away. Unfortunately this is not the case as generally the cable needs to be lashed to a metal support wire (which must be connected to ground potential) and that wire then raises the safety issues.

It has further been claimed that electricity companies commonly install their own optical fibre cables high up among the electricity lines, however this approach would be impractical along local roads where lead-ins need to be connected to most if not all houses as the installation and maintenance workforce would need to be highly skilled in dealing with high voltage procedures compared to the lower skill level usual for telecommunication works.

[9] In Senate Official Hansard (No. 6, 2009) for Tuesday 16 June 2009 at page 3316 http://www.aph.gov.au/hansard/senate/dailys/ds160609.pdf , Senator Conroy only recognised that the smaller diameter of optical fibre cable could minimise the adverse visual impact if strung aerially.

Unless a deal is done with Telstra for much of the future network to be undergrounded in their pipes and conduits, we should be very worried about 'investing in nation-building infrastructure needed for tomorrow' (quoting the Prime Minister) that is held up by rotting electricity poles. It smacks of putting 'all the eggs in the one basket' and outstandingly fails the basic premise of creating 21st century broadband to be a building block of Australia's future economy.

It is simply ludicrous to create a next generation data network whose aerial component will inevitably face reduced service reliability. On this count, it is false to compare the NBN with the existing HFC cable-delivered pay television and Internet data networks as they were never intended to carry life saving telecommunication services under a government mandate. It would be foolish to embark on a nation-building exercise based on such a shortcut approach to construction cost and roll-out speed.

Unless the Ministerial Telecommunications (Low-impact facilities) Determination 1997 is amended, it will require the NBN carrier to seek development approval from state, territory and/or local governments. Failing success in those domains, the NBN carrier would need to apply to ACMA for a Facility Installation Permit arguing that any aerial cabling will be an important part of a nationally significant telecommunications network. Either way, there is a critical need for community-wide consultation so that the public can be properly informed as to why their taxes are to be spent on tomorrow's nation-building telecommunications infrastructure to be held up by yesterday's rotting electricity poles.

A Truly Inspirational Vision

It is timely to ask: what lessons can be learned from the pay television aerial cabling fiasco of 1995/97? Whilst the Ministerial Telecommunications (Low-impact facilities) Determination 1997 - due to the referral of approval powers back to state and local governments - effectively prevents further aerial cabling by telecommunication carriers, it must not be forgotten that the federal government had only 'closed the door after the horse had bolted'. The Determination came into effect after Optus and Telstra had achieved their required roll-outs.

Nevertheless, the public at large did benefit from a comprehensive study into practical options for retrospectively undergrounding both aerial electricity lines and telecommunication cables throughout urban and suburban Australia. If electricity lines are undergrounded then there is no opportunity for telecommunication carriers to exploit aerial construction.

The *Putting Cables Underground Working Group (*PCUWG) study,[10] compulsorily funded by Telstra and Optus at a cost of $1.5 million, was most thoroughly undertaken with a large team of technical and economic specialists plus local government advisors. The study was coordinated by the then Department of

[10] For a full copy of the report of the Putting Cables Underground Working Group, refer to http://www.dbcde.gov.au/__data/assets/word_doc/0004/7969/Putting_Cables_Underground.doc ; also noted at http://nla.gov.au/nla.cat-vn2246230

Communications, Information Technology and the Arts. It involved significant input from the electricity industry nationwide and from Telstra.[11]

Of the many study findings, a rather prescient one concluded that decreased electrical transmission losses arising from underground installation would result in reduced greenhouse gas emissions. Other quantifiable benefits of putting electricity cables underground were said to include:

- reduced motor vehicle collisions with poles;
- reduced losses caused by electricity outages;
- reduced network maintenance costs;
- reduced tree pruning costs;
- beneficial impact on property values;
- reduced electrocutions; and
- reduced bushfire risks.

Finding 1 on page six of the report reveals that the study scoped all urban and suburban localities with a population greater than 30,000. This roughly translates to 90 per cent of Australia's population and about 7.2 million households.[12]
From the report Summary on pages three and four, the average cost of undergrounding both electricity and telecommunication infrastructure was estimated as $5516 per household in 1998. With innovative design and installation plus economies of scale savings, this could reduce to $3600 per household.

If these costs are projected forward from the study date of 1998 to 2008, it is reasonable to assume that the $3600 figure could rise to $4900.[13] Multiplying $4900 per household by 7.2 million households produces an estimated outlay of $35 billion; alternatively, one could multiply $5000 by 8 million and arrive at $40 billion. Such 'back of the envelope' level of estimation would appear to be at least as good as what has been publicly declared to date supporting the NBN announcement.[14]

Although the PCUWG scoped the cost of undergrounding electricity lines and HFC cables, we are not in a position to subsequently factor in the additional impact of the NBN - however in broad terms the cost should be equivalent if the NBN network were to replace the now over a decade old HFC-based pay television and cable modem network. In that case, there is a prime facie case to underground both the NBN and electricity infrastructure at the same time for a broadly similar outlay compared to the mooted $43 billion for the NBN.

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[11] Though Telstra's detailed costing information was confidential and not explicitly divulged in the final report, it was fully factored into the financial conclusions.
[12] For example, refer to http://en.wikipedia.org/wiki/List_of_cities_in_Australia_by_population ; for the purposes of this 'back of envelope' calculation it is safe to assume an average of 2.5 persons per household. The 90 per cent figure conveniently aligns with the announced NBN plans for cable-delivered broadband service.
[13] For example, refer to http://www.rba.gov.au/calculator/calc.go whereupon an estimated escalation of $3600 at 1998 prices becomes $4900 at 2008 prices. RBA calculations for 2009 are not currently available.
[14] We are dealing here with a gross average, whereby most of the swings and roundabouts even out and hence for national budgetary purposes the answer can be quite representative; the original PCUWG estimate was determined utilising a complex financial model from Monash University.

The federal government's initial announcement to roll-out a National Broadband Network represented a truly visionary national policy, however it will be severely blighted if in practice any significant extent of the access infrastructure is to be aerially constructed. Now is the time for the federal government to instead adopt a truly inspirational vision for Australia by issuing a revised policy that results in the NBN to be installed fully underground along with all existing aerial electricity lines.

Conclusion

Aerial construction of the access network component of the National Broadband Network will seriously degrade service reliability. Australians should be very worried about 'investing in nation-building infrastructure needed for tomorrow' that is held up by rotting electricity poles. Such an outcome outstandingly fails the basic premise of creating 21st century broadband as a building block of Australia's future digital economy.

It cannot be in the public interest for the Telecommunications (Low-impact facilities) Determination 1997 to be amended as defining NBN cabling of 'low impact'. This issue requires community-wide consultation, not deals behind closed doors with captive stakeholders.

A truly nation-building alternative would be to underground all aerial utility construction – with the most notable impact being on electricity distribution lines. There are grounds to believe that this could be achieved for a broadly similar financial outlay if appropriate economies of scale and novel approaches are exploited.

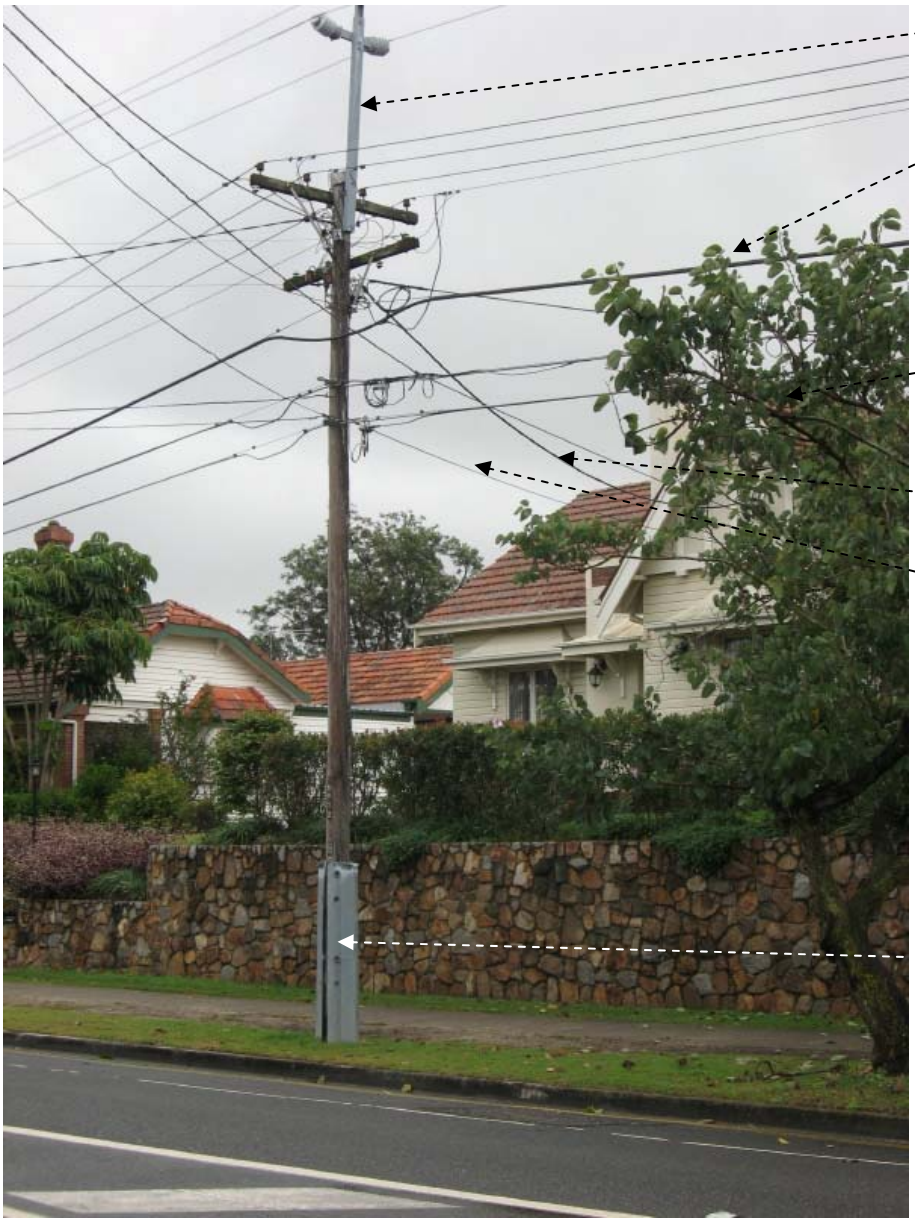

Figure 1: A typical electricity pole in Abbotsleigh Street (suburb of Holland Park, Brisbane) carrying 11 kilovolt and 415 volt electricity lines and since 1996 additionally burdened with Optus and Telstra HFC cables - illustrating the multitude of lead-ins serving houses on both sides of the street, plus the parlous state of the wooden pole which has been augmented by the steel extender on top supporting the 11 kilovolt lines and two large steel reinforcement 'stakes' compensating for the rotting wood below the ground.

Picture taken by Ross Kelso

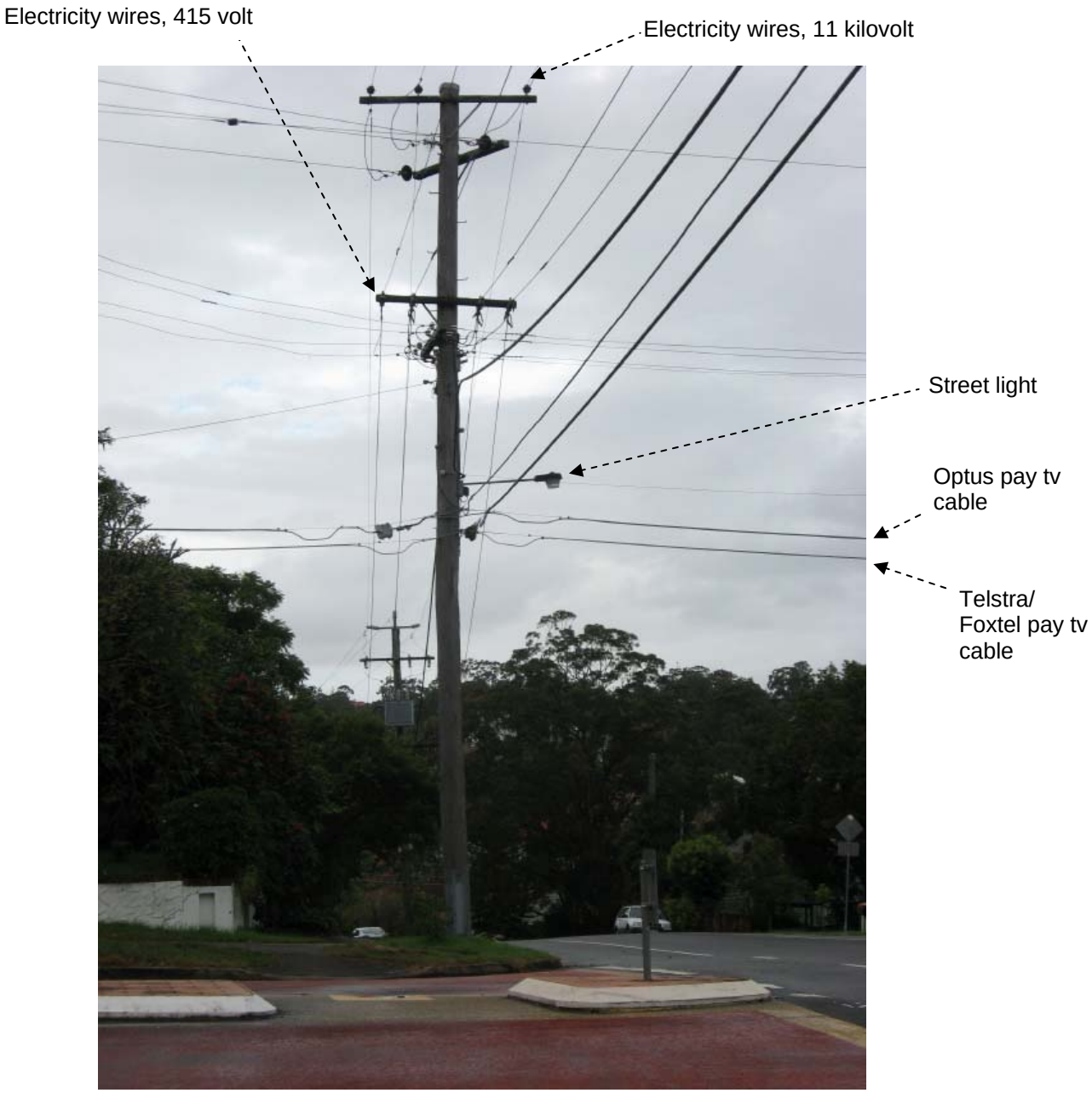

Figure 2: A pole at the corner of Abbotsleigh Street and Geelong Avenue (suburb of Holland Park, Brisbane) adjacent to that of Figure 1 - illustrating the added complexity of lines and cables arising at a typical street intersection, together with the higher potential for being struck by road vehicles.

Picture taken by Ross Kelso

Figure 3: Mutilated tree in a Sydney street under a pole route also supporting two HFC cables. This was made necessary to obtain the required clearance; through increased utility charges, we actually pay for this to be done!
Picture taken by Peter Downey, Cables Downunder

Figure 4: Electricity pole destroyed and lines brought down by an errant road vehicle; imagine the impact on life-line telecommunications if the government-mandated National Broadband Network had been attached to this pole!
Picture courtesy of Peter Downey, Cables Downunder

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