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Committee Secretary
Senate Select Committee on the National Broadband Network
Department of the Senate
PO Box 6100
Parliament House
Canberra ACT 2600
Australia.

Dear Ms Kelly

Inquiry into the proposed National Broadband Network

I am pleased to make the following submission to the current committee Inquiry. My 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 aspects from telecommunications strategy, policy and regulation to the social and economic aspects of information and communication technology and services.

Earlier this year, I completed doctoral studies at Queensland University of Technology 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?* Although commenced some five years ago, this study now seems to be particularly prescient of current events. A full copy of my doctoral thesis can be downloaded at http://www.rosskelso.com or via http://adt.library.qut.edu.au/adt-qut/public/adt-QUT20080624.153258/.

The following submission is based on an amalgam of that study and lessons I have learned arising from my previous consultancy, research and industry experience. It mainly addresses items 2(d) and (e) of the Inquiry Terms of Reference.

Yours sincerely

Dr Ross Kelso

Submission by Dr Ross Kelso to the Senate Select Committee on the Proposed National Broadband Network

Wireline telecommunications infrastructure in the access network is undergoing a veritable technological and commercial revolution. The traditional paired-copper access network is being modernised with optical fibre deployed ever closer to customers, culminating soon with fibre-to-the-premise networks or some variant thereof. Although bandwidth ceases to be a scarce commodity, the underlying natural monopoly will most likely be strengthened.

National competition policy desires 'open' access to multiple service providers yet commercial pressure calls for closure. This has been the recent experience with the hybrid fibre coaxial networks delivering pay television and Internet access where closure has eventuated.

Australia's telecommunications access regime has been captured by network providers whose business plans are predicated on either closure or highly restrictive openness. Since 1993, our politicians would appear to have been spellbound by the image (and reality) of the 'romantic' or 'heroic' builder of telecommunications infrastructure and have paid only lip service to the importance of competition.

It need not be this way. The advent of a National Broadband Network offers a generational opportunity to ensure that Australia's future telecommunications industry will better serve the interests of end-users, rather than primarily the interests of shareholders.

Importance of this Inquiry

On 11 April 2008, the Minister for Broadband, Communications and the Digital Economy, Senator Stephen Conroy, announced the release of a Request for Proposals to roll out and operate a new, open access, high-speed, optical fibre-based broadband network. The network was claimed to represent the single largest investment in broadband infrastructure in Australia's history. The provider to build the National Broadband Network (NBN) would be selected through a competitive assessment process "to maximise outcomes for the community". The Department's website stated that "this process will be transparent and accountable".[1]

The Minister had previously announced a Panel of Experts to assess proposals to build the National Broadband Network with a view to identifying the successful provider by end 2008. The Department has also appointed a number of specialist advisers. Industry and public interest groups were invited to provide submissions on regulatory issues, including the matter of consumer safeguards. Copies of these submissions are now publicly available and the Panel of Experts could see fit to take them into account in evaluating the proposals.

It is difficult to appreciate how this process can be transparent and accountable, apart from the Minister being ultimately accountable to Parliament. Neither the Panel

[1] Refer to http://www.dbcde.gov.au/communications_for_business/funding_programs__and__support/national_broadband_network

of Experts nor the specialist advisors are required or are likely to publish their deliberations. All are contracted to the Department and their advice cannot be said to be independent. Whilst the tabling of submissions from industry and public interest groups does constitute a public process of consultation, such consultation is only one way communication. There is no process for official feedback nor further public scrutiny.

Most importantly, the Minister has launched the Request for Proposals and selection process without declaring the government's desired regulatory position. This Senate Committee offers the only opportunity for the consideration of public submissions by a body independent of the Department or its Minister.

Naturally a Monopoly

Of all telecommunications media, optical fibre in the access network presents the greatest opportunity for dominating the market for delivering to end-users services that are bandwidth intensive and non-mobile.

Optical fibre in access network, resulting in very large economies of both scale and scope, exhibits many of the characteristics of a strong natural monopoly and as a consequence is highly likely to be anti-competitive unless appropriately regulated. With the cost of civil works (digging trenches, laying conduit, installing manholes and pits, pulling cable) comprising some 90 per cent of total capital cost, an asset is created which is largely non-recoverable, i.e. it is said to be 'sunk'.

However for an aspiring competitor, typically not the incumbent network operator, the nature of this sunk cost poses considerable disadvantage. An entrant wishing to overbuild with the same optical fibre technology must incur at least the same capital cost which in turn would become immediately sunk. If, as in almost all instances, the incumbent had exploited an existing copper-based access network involving in-situ and written-down conduits, then the entrant must incur comparatively greater initial costs to replicate the same network design.

This adverse situation can only improve somewhat if the entrant adopts a cost-saving approach not available to the incumbent, such as by installing aerial cabling as was the case when Optus Vision rolled out its hybrid fibre coaxial (HFC) network versus the initially underground cabling by Telstra. In any case, the usual market behaviour of an incumbent would be to drop prices to a level so low as to generate insufficient revenue to cover the entrant's sunk costs, thereby severely damaging the entrant's business case.

Once an access network is upgraded to fibre-to-the-node (FTTN)/fibre-to-the-premise (FTTP), the inherent economies of scale and scope significantly exceed that of any other available access technology for delivering non-mobile services. Simply put, such a network can for many decades thereafter continue to deliver ever-increasing levels of bandwidth for almost no added cost to the network provider. The opportunities for facilities-based competition are thereafter drastically diminished. Unless the access network has been appropriately designed, true service-based competition is effectively chilled.

A Telecommunications Watershed

Australia's dominant wireline infrastructure is that of the paired-copper access network for connecting customers with the public switched telephone network (PSTN). The paired-copper access network was and remains ubiquitous and continues to be regulated to provide open access to competing service providers and to a wide range of non-telephone customer attachments. These characteristics have been pivotal to telephony service competition since 1991 and to the rapid take-up of dial-up access to the Internet during the late 1990s.

The roll-out by Telstra and Optus of HFC networks from 1995 to 1997 primarily for the delivery of pay television was the next watershed in the development of a wireline access network available to the public. These networks are privately owned and operated, but not ubiquitous.

Widespread deployment of fibre-to-the-premise networks, or their close variants from 2009 onwards will mark another watershed that is unlikely to be overtaken technologically for many decades. Fibre-to-the-premise offers a quantum change – the potential to end the scarcity of communications bandwidth available to small to medium enterprise (SME) and residential customers, heralding the arrival of a veritable cornucopia of services. At the same time, fibre-to-the-premise is likely to reinforce the natural monopoly of much of the existing access network infrastructure.

Such a seminal occasion highlights the importance of reassessing the appropriateness of Australia's telecommunications policy and regulatory environments. If competition continues to be central to national economic and social development, then we need an access regime that continues to be effective. It must cope with ongoing technological innovation and creative commercial challenges. However the access regime must never lose sight of the fact that the telecommunications industry only exists to serve end-users.

Removing the Barriers to Access

The Request for Proposals prescribes 'open access' – a highly laudable concept and especially pertinent to the National Broadband Network. However, the Australian telecommunications industry has been conditioned to accept a far more limited form of access which has singularly failed to promote competition, particularly involving 'post-PSTN' wireline access infrastructure. Only open access is in the better interests of end-users.

Since the early 1990s, Australia's electricity, gas, telecommunications, water, rail, air services and port services industries have all progressed towards more open markets and greater competition. However, many of these industries involve bottleneck infrastructure for which competition becomes difficult if not infeasible. Following recommendations in the 1993 Hilmer Review, the Commonwealth Government introduced a national access regime for such infrastructure, to be implemented via a new Part IIIA of the Trade Practices Act 1974 (TPA).

This regime established legal rights for third parties to share the use, on reasonable terms and conditions, of certain infrastructure services or facilities deemed of national

significance. For example, such a third-party could gain the right to access the railway line of another company to run its own trains. In this context, 'third-party access' means that a competitive service provider can gain access to the infrastructure or services of another service provider and in so doing establish access to a new customer base.

With the introduction of open competition into the Australian telecommunications market commencing 1 July 1997, the Australian Competition and Consumer Commission (ACCC) gained the power to mandate access to a carriage service by 'declaring' that service[2] under a new Part XIC of the TPA. The prime object of Part XIC is to promote the long-term interests of end-users (LTIE) in what are called 'listed services', that is, carriage services or services provided by means of carriage services. In determining what constitutes the LTIE, the ACCC must pay regard to the objectives of promoting competition in markets for the listed services, achieving any-to-any connectivity in relation to carriage services that involve communication between end-users, and encouraging the economically efficient use of, and the economically efficient investment in, the infrastructure by which the listed services are supplied.

Unfortunately, the more generalist Hilmer approach to opening access to bottleneck infrastructure – coupled with continued political interference - has failed in the case of Australian telecommunications. The historical record shows that successive Australian governments have never really committed to third-party access for services derived from infrastructure beyond that of the paired copper PSTN.[3] Once broadband services deliverable via post-PSTN access infrastructure came into contention from 1994, the telecommunications access regime has been repeatedly compromised by the granting of incentives for investment that favoured incumbency. These government interventions have had the practical outcome of being generally anti-competitive, effectively killing off open access to the services of post-PSTN infrastructure. In summary, our politicians would appear to have been spellbound by the image (and reality) of the 'romantic' or 'heroic' builder of telecommunications infrastructure[4] and have paid only lip service to the importance of competition for benefitting end-users.

The regulatory regime for access is now labyrinthine and wide open to gaming. It has been exploited by access providers – primarily Telstra - to cause years of delay, wearing down the ability of access seekers to ultimately compete. This conclusion is a derivative of that above – the repeated granting of incentives for investment, in reality a series of access holidays, has been excessively liberal in favour of access providers. The outcome has been that access providers are encouraged to be obstructive in dealing with access seekers.

Not so long ago there was another way of dealing with access to telecommunications facilities and services, but it has been stealthily excised from legislation. It is called 'common carriage' and is central to the realisation of any future open access regime.

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[2] Under Part XIC of the TPA, there is no general right of access. Rather, the ACCC must first 'declare' (that is, decide to regulate) a particular service.

[3] Kelso, D.R., "Open Access to Next Generation Broadband", QUT PhD Thesis, February 2008; refer to http://www.rosskelso.com

[4] Crawford, S. (2006). "Network Rules." Duke Journal of Law & Contemporary Problems.

The principle of common carriage is rooted deeply in English common law. Early examples of common or public occupations that attracted special obligations included those of ferrymen, innkeepers, surgeons and wharf operators. 'Common' in that context meant 'open to serving the general public' or 'general'.

In more modern times, businesses such as postal services, railways, telecommunications, airplanes, taxis, roads and utilities have been treated as common carriers. While each has a different history of attaining such classification, they appear to share two dominant characteristics, viz. offering service to the general public, regardless of private ownership or operation, and the delivery of undifferentiated service such as carriage or of commodity items.

The basic principle of common carriage in telecommunications, that all users must be served without discrimination, has played an important role in the infrastructure services of transportation and communications, aiding telecommunications users' access and thereby also stimulating the development of networks.

The most critical factor in mass adoption of the Internet has been the common carriage obligation of telephone companies which permitted dial-up access between users and Internet service providers (ISPs). This non-discriminatory connection of modems, using signals that mimic telephony calls, connected customers with narrowband ISPs who in turn had established data lines to the public Internet.

Prior to 1975, telecommunication network and service access in Australia was not an issue as the Postmaster-General's Department was a monopolistic common carrier and competition was simply not permitted. After 1975, the Australian Tele-communications Commission (Telecom) continued the national responsibility for providing a standard telephone service. It could only discriminate by refusing such provision on the grounds of impracticality or the services not being reasonably required. The Minister could also direct the Commission as necessary 'in the public interest'.

During the 1980s, the monopoly powers of Telecom were increasingly brought into question by the government, inquiries and embryonic competitors. By 1989, Telecom retained the monopoly to provide services via the PSTN but all services other than those 'reserved' for Telecom were open to competition, such as the provision of value added services and private networks. Where Telecom refused or failed to supply a standard telephone service, the new regulator (AUSTEL) could direct Telecom to carry out its community service obligation. Telecom was also obliged to connect to these embryonic competitors and was prohibited from discriminating against them.

This semblance of common carriage continued through the Telecommunication Acts of 1991 and 1997, but only in the form of requirements for all carriers to interconnect and for Telstra to be obliged to deliver a standard telephone service to the whole community, resulting in the Universal Service Obligation. The key point to note is that this spirit, if not reality of common carriage has been limited to telephony or telephony-like services. It has also been restricted to an obligation to deliver only low bit-rate data services. We now have the opportunity to restore common carriage to

the proposed National Broadband Network, in the form of an obligation for open access.

This opportunity is highly propitious since the successful implementation of common carriage is strongly favoured by:

- the relative abundance of transmission capacity delivered by optical fibre, and
- the practicability of more closely approximating one-on-one connectivity between end-users and competitive service providers, which is determined by the chosen network design for the NBN.

Open access provides individual customers with a choice of service providers, offering the promise of choice in accessing all types of information and/or entertainment services plus the freedom to communicate or publish via channels of their choosing. Choice implies competition in service provision and it is competition that offers better value propositions and drives innovation.

The Network Design does Matter

The architecture and design of any optical fibre access network is the crucial determinant of its ability to accommodate competitive service providers in a non-discriminatory manner. It is critical to factor this into regulatory considerations.

Wireline telecommunication access networks are modern-day behemoths, extensive in coverage, expensive to build and slow to change. When each opportunity for change does arise, the occasion should be of national significance as the next opportunity may be decades away. The purpose of generational change is to significantly upgrade service capability and this is often effected through a wholesale change in network architecture and system design. The proposed National Broadband Network represents Australia's next such opportunity.[5]

Since the inevitable natural monopoly of widespread rollout of optical fibre in the access network will make facilities-based competition infeasible, the key factor will be whether the next generation wireline network is capable of permitting service-based competition via unbundling to the lowest possible network element. This is the only way end-users can experience true innovation arising from competition.

Although the concept and practice of competitive access through unbundling is well established with the PSTN, such application to FTTN/FTTP networks and services is currently novel. Incumbent network providers can frustrate attempts to unbundle networks or services through either intentional design or merely the adoption of industry designs that just happen to assume the network provider to be the sole service provider.

[5] Australian telecommunications witnessed a generational change of sorts with the roll-out by Telstra and Optus of hybrid-fibre coaxial or HFC networks to the major capital cities and key regional areas during 1995/96. Rolled out commercially from 2000, the TransACT network represents the most recent (and true to form) generational change albeit restricted to the national capital of Canberra.

The architecture and design of a given FTTP network is the crucial determinant of its ability to accommodate multiple service providers in a non-discriminatory manner.[6] The differentiating factor is the extent to which a network architecture and design has been engineered to maintain a 'one-to-one' and symmetrical relationship between service providers and customers. The stronger this relationship, the more readily choice of service providers can be supported as well as services delivered that are unique to particular service providers. Conversely, the greater the sharing of resources in the access network, the lower the ability to support choice of service providers and the more likely their service packages will be replicas of one another – with there being only monopoly service provision in the limiting case.

Left unregulated, we should not be surprised if the operator of an optical fibre access network sees fit to minimise the outcomes for competitive access through what has been called 'defensive engineering'.

Some Public Policy Goals

As this submission has addressed only a portion of the Inquiry Terms of Reference, the following suggested public policy goals are necessarily incomplete.

- A prime goal in selecting the NBN provider and managing ongoing deliverables should be to ensure full transparency of process and public accountability for outcomes.

  It is totally unacceptable for agreements with the NBN provider to hide behind the cloak of 'commercial-in-confidence' secrecy. This follows not just from the granting of some $4.7 billion of public money, but from recognition that the government is creating an enduring natural monopoly. When the Australian PSTN last witnessed generational change in 1991 and then 1997, these occasions were preceded by significant public deliberation. With the NBN shaping up as the next generation, and possibly the last for decades to come, transparency and accountability are crucial factors.

- A key goal should be to ensure the provision of open access in accord with the time-honoured principle of common carriage.

  Common carriage has underpinned the rapid adoption of modern telecommunication services as a force for social good. All users are served without discrimination. Current access regulation under the Trade Practices Act has failed as it encourages obstruction and is incapable of accommodating a natural monopoly network. Only open access is in the better interests of end-users.

- A consequent goal should be to ensure that the selected NBN provider delivers an optical fibre-based access network employing an architecture and design capable of accommodating competitive service providers in a non-discriminatory manner.

[6] Kelso, D.R., "Open Access to Next Generation Broadband", QUT PhD Thesis, February 2008, Chapter Six discusses this in greater detail; refer to http://www.rosskelso.com

Beyond guaranteeing initial delivery of a minimum broadband speed of 12 Mb/sec as per the Request for Proposals, it is essential that the NBN also be capable of delivering ever increasing speeds to meet the ongoing requirements of end-users. In particular, it is crucial that ongoing network architecture and design continues to support open access. This can only be achieved if regulation for open access also encompasses the underlying NBN facilities or infrastructure, not just the derived services.

Concluding Comment

The proposed National Broadband Network, involving extensive deployment of optical fibre deeper into the access network, creates a natural monopoly of an enduring nature. It is capable of giving rise to complex technical and commercial bottlenecks that strongly encourage anti-competitive behaviour. The first optical fibre in any access network will be the last installed.

With facilities-based competition being infeasible, that is, the 'stepping stone' theory of investment collapses, the only alternative to monopolistic service delivery with the NBN will be effective service-level competition. Unfortunately the track record of the current access regime as applied to post-PSTN infrastructure augers badly for effective service-level competition via optical fibre in the access network.

As we move into the era of the National Broadband Network, the critical issue is how to preserve the benefits of openness that have long characterized the PSTN first for telephony and then narrowband Internet services, where innovation and competition have increasingly flourished. Getting this right will significantly assist in further developing Australia's networked information economy and improving our international competitiveness.

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