



THE GOVERNMENT OF NORFOLK ISLAND

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5 January 2012

Secretariat
Regional Telecommunications Review

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Thank you for the opportunity to lodge a late submission on behalf of Norfolk Island.

Due to the time constraints I have taken the liberty to simply attach a copy of a submission which was sent to the Department of Regional Australia, Regional Development and Local Government which outlines Norfolk Island's unique telecommunication requirements to best support health, education, private and public sector requirements, this document was seeking assistance from the Department, which has Federal responsibility for Norfolk Island, to bring Norfolk Island's telecommunication services into line with service delivery in mainland Australia.

Attached are the following documents:

- Letter dated 18 July 2011 addressed to Mr Simon Pellatt, Acting Director, Norfolk Island Taskforce, Territories East, Department of Regional Australia, Regional Development and Local Government;
- "Service Delivery Comparison – Fibre Vs Satellite; and
- "Cost Comparison – Fibre Vs Satellite.

I draw your attention in particular to pages 2-5 of the letter to Mr Pellatt which outlines the NBN Co Proposal regarding Norfolk Island, considerations and suggested solution.

I have also attached a copy of the "Review of Telecommunications Competition on Norfolk Island" to demonstrate some of the challenges associated with economies of scale for small remote communities (particularly island communities).

The Norfolk Island Government would be pleased to have an opportunity to meet with the Review Team to further elaborate the unique circumstances of Norfolk Island to ensure the best outcomes for enhanced telecommunications.

Yours sincerely

Andre Nobbs
Minister for Tourism, Industry & Development



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18 July 2011

Simon Pellatt
Acting Director, Norfolk Island Taskforce
Territories East
Department of Regional Australia, Regional Development and Local Government
GPO Box 803
CANBERRA ACT 2601

Dear Mr Pellatt

I write to seek your assistance with bringing Norfolk Island's internet services into line with service delivery in metropolitan areas within mainland Australia. In this letter I will outline the current internet service levels on Norfolk Island and provide the optimum solution for connection for the Island, both financially and technically. It will allow the Norfolk Island community to have an internet service that is now expected by all Australians and will provide for vital economic development on the Island.

BACKGROUND INFORMATION

Norfolk Telecom is a wholly owned entity of the Norfolk Island Government. The township and primary business area is concentrated around the central communications building within a 1.5 kilometre radius and even the most isolated service delivery points on the Island are a maximum distance of eight kilometres from the central exchange. Norfolk Telecom owns and maintains a copper network which extends from the central communications centre to 100% of premises on Norfolk Island. Fibre has been layed between the central communications building and the current and planned satellite base stations and in the process strategic communications points such as the hospital, airport, government offices zone, radio and TV Broadcast centre and the high point on the Island (a central "mount"), used for communication services, were also captured. These factors are conducive to a good quality, high speed communications network with a relatively low cost for expansion and infrastructure build.

Norfolk Telecom is currently providing access to Internet services over an ADSL/ADSL2+ network and Wireless (802.11a/b/g) with backhaul on a combination of copper and fibre. A Fibre to the Node project is also currently in progress, scheduled to be completed in August 2011, and will provide an initial 100Mb/s backhaul capability from the nodes to the central communications centre. This will provide Norfolk Telecom with a network capable of delivering ADSL2+ standard services (12M download / 1M upload) to over 90% of local premises.

The main issue that Norfolk Telecom faces is the Island's isolation and therefore the provision and expense of backhaul from Norfolk Island to a Point of Interconnect with a wholesale Internet Access Provider. The isolation of the island means that all current communications links outside of Norfolk Island must be provided via satellite based communications systems. To highlight the restrictive nature of satellite communications services, a quick comparison can be made between local infrastructure build costs and the costs of providing satellite links between the local infrastructure and the outside world. The above local distribution infrastructure capabilities have been delivered over a seven year timeframe at an estimated total cost of \$350,000 with minimal maintenance or expansion costs per year. In contrast, cost of provision of international satellite links for interconnection of the local network to the internet over the same period is well in excess of \$2,000,000.

In addition the high cost of provision of satellite services means that the satellite links provided are very low bandwidth with the current service contention ratio for the consumer well in excess of 800:1. This is far beyond the average 50:1 contention for internet service access currently provided to the majority of Australians.

The high costs and the low backhaul bandwidth are ultimately passed onto the consumer and whilst the charges are competitive with regional Australia, the bandwidths available to the customer are slow even though the capability for local delivery is there. Ultimately this means that the satellite links utilised for backhaul regularly experience capacity flat-line issues and translates to extremely slow internet upload and download speeds for the consumer. This of course leads to negative implications for all businesses and community members who need to utilise online services.

NBN Co Proposal regarding Norfolk Island

In the NBN Co Corporate Plan (2011-2013) Norfolk Island is identified as a target service delivery point and is shown as being in an environment where services will be delivered by satellite with the current timeframe for delivery of NBN Co owned satellite services estimated to begin in late 2015. The Satellite Access Service solution they suggest would be a step backwards for Norfolk Island.

NBN Co's core issues raised in their Corporate Plan (2011-2013) in section 5.6 can be summarised as:

1. Low population density with some 6.5% of Australia containing under one person per square kilometre
2. Fragmented population pockets where small numbers of people are located in pockets at fringes of fibre serving areas or in isolated locations.

Norfolk Island is without doubt, an isolated Australian community, it is some 1200 kilometres east of Australia, with the nearest land mass being New Caledonia some 600 kilometres to the North, however the other issues raised do not apply.

Norfolk Island has an average population of 54 people per square kilometre and with the uninhabitable areas of the Island removed, this rises to an average of 64 people per square kilometre. These numbers would be well within the bell curve average for the first 80% of the population of Australia at 77 people per square kilometre, and is far above “less than 1 person per square kilometre”. As this information demonstrates, the proposed NBN outcomes are not a best solution scenario and do not advance current capacities or provide avenues for long term expansion.

CONSIDERATIONS

Following our telephone conference of date 07 July 2011 I would now seek your assistance in moving forward with an analysis for Norfolk Island's connectivity to the currently proposed fibre optic cable that is to be laid between Noumea and New Zealand.

As discussed during the teleconference the capacities currently utilized by private and government sectors on Norfolk in the areas of Internet and telephony communications are such that for an improved outcome in our economic development the national broad band offering does not advance or enhance Norfolk Island's current connectivity.

Satellite bandwidth availability, costs and latency affect not only the economic development in our area, these limitations equally impact upon our ability to maintain contemporary connections with both education and E. health options.

As discussed there is a necessity for VoIP services to be of a suitable standard to enable and enhance options for tele nursing tele medical, parent help lines and other essential services to the community on the Island as they do not have immediate access to, as a result of our remote location. Collaborative work between ISP operators within mainland Australia and also Norfolk Telecom have attempted use of VoIP over satellite with the same outcome being experienced, the call quality is so low that conversation is unable to be held.

One in three Australian workers were using telework in 2005, the Norfolk Island Government would like those statistics to apply for Norfolk Islander's in the near future.

WHY FIBRE OPTIC

Fibre optic cable linking is the optimum connection financially and technically to expand Norfolk Island communication, provision of mobile services, internet services, E.health and business opportunities. These opportunities are all economic development opportunities which is clearly outlined in the inter-governmental Road Map as crucial for Norfolk Island reform. This facility will also enhance the opportunities for the Norfolk Island School to fully participate in online educational and curriculum activities.

Additionally as we move towards closer collaboration with Australian in the areas of immigration, customs and border control, as well as social services there will be a greater requirement for data flow between the two governments and these operational areas.

The ongoing recurring bandwidth charges by satellite are extremely high compared to recurring bandwidth charge for fibre connection. Also there are limitations in the bandwidth that can be provided over satellite and the negative effects of transmission latency and compression management, as well as the requirement to upgrade the existing satellite equipment.

SOLUTION

The Norfolk Island Government understands the importance of a strong and reliable internet service as imperative to bringing essential services and income to our economically and geographically challenged Island and would like to present the following solution for NBNCo and the Department of Regional Australia, Regional Development and Local Government's attention.

A submarine cable is being planned and installed by SPIN and is to provide connectivity between New Caledonia and New Zealand and will be passing very close to Norfolk Island. Norfolk Island has been offered connection to the submarine cable by the South Pacific Islands Submarine Optic Fibre Network (SPIN), which includes costed options for varied stages of connection.

The opportunity to connect to the SPIN Fibre project needs to be considered now as it will not be logistically and financially possible to connect to the submarine cable at a later date once the cable is live. SPIN have provided, as one of the options in the proposal, to allow a future connection by way of a branching unit installed waiting for future connection. However this is not the recommended or preferred option due to additional cable ship and fibre manufacture timelines and cost implications.

Utilising the SPIN cable for international connection is by far the superior technical solution as well as the cheapest option for monthly recurring connection costs and is unrivalled in offering health, educational and community support outcomes, as well as ensuring a state of the art offering for business investment and economic development.

For Norfolk Island to have access to the SPIN submarine cable requires a significant capital injection in the project which will provide a turn-key solution (Cable to shore, termination of the cable into an existing cable station and installation of the communications systems hardware required to deliver the prescribed services). It is critical that consideration be given to the SPIN project now as the planning, cable manufacture, undersea cabling and connection commitments are required within a relatively short time frame.

Comparison of Satellite v Submarine monthly recurring charges (MRC):

Satellite

| Bandwidth In (Mbps) | Bandwidth Out (Mbps) | Monthly Cost | Total Bandwidth (Mbps) | Cost / Mbps |
|---------------------|----------------------|--------------|------------------------|-------------|
| 10 | 5 | \$37,788.00 | 15 | \$2519.20 |

Fibre (Turn-key implementation cost : \$7,880,000.00)

| Service Option | Bandwidth In (Mbps) | Bandwidth Out (Mbps) | Monthly Cost | Total Bandwidth (Mbps) | Cost / Mbps |
|----------------|---------------------|----------------------|--------------|------------------------|-------------|
| STM-1 | 155 | 155 | \$31,500.00 | 310 | \$101.61 |
| STM-4 | 622 | 622 | \$57,700.00 | 1244 | \$45.58 |
| STM-16 | 2488 | 2488 | \$103,000.00 | 4976 | \$20.70 |

The comparison above is a quick summary which highlights the difference in costs per Meg between satellite and fibre based services. Included with this letter is a full cost comparison table which also shows the costs of upgrading the satellite to an equivalent level of service to fibre and the long term cost of operation of both services. Both the comparison above and the included comparison tables show that the SPIN Fibre connection is a much greater value for money investment and that the Government would obtain a far superior product for delivery of service.

As clearly shown above and in the included comparison tables, the implementation fee for Fibre is a significant capital injection however as the included tables also show quite clearly, this initial expenditure proves to be very economic, even in the short term. An equivalent level of service provided via Satellite and in line with national broadband policy will equal the cost of implementation within three years and will cost 300% more within a ten year timeframe.

With regards to the provision of service to the consumer, there would be minimal further outlay as Norfolk Telecom already has a domestic fibre network that connects the cable landing station to the Norfolk Telecom communications centre. This will then link directly into the Norfolk Telecom domestic fibre and DSL network ensuring full capabilities are available throughout government service delivery, private sector and resident community.

There are tight timeframes in relation to this solution as the undersea survey that allows for the design of the cable is scheduled to commence this year. Both the survey and the design are critical for the placement of the fibre stubb and the route selection for the main cable and the spur cable that will allow inclusion of Norfolk Island in the project. The SPIN cable project will need a direction from the NI Government prior to the survey which may commence around October 2011 to ensure that Norfolk is able to benefit from SPIN and not miss this outstanding opportunity. Furthermore, they will need a confirmation of the Governments

commitment to the project prior to manufacture of the cable. Commercially, SPIN will need to know that they should do the survey in the short term, the further expectation would be commercial commitment for the cable and for the termination hardware to facilitate a full turnkey solution.

CONCLUSION

I would assume a large consideration for NBN Co to have a satellite system for Norfolk Island as opposed to a fibre undersea cable from the Australian mainland is a considerable cost issue to weigh up. However with the information provided in this letter the opportunity to tap into the SPIN network is relatively cheap and the positives of fibre far out weigh a Satellite Access System.

I look forward to progressing this matter with you with a degree of urgency.

Yours sincerely

A handwritten signature in blue ink, appearing to read 'André Nobbs', written in a cursive style.

André Nobbs
Minister for Tourism, Industry & Development

Cost Comparison - Fibre Vs Satellite

Cost comparison of backhaul costs from Norfolk Island to a point of connection to Internet Services
Australian Equivalent level service capacity based on Service Delivery Cost Report to Minister for Communications

Comparison of Data Rates, Implementation costs and Recurring Charges

| | Fibre | | | | | Satellite | | | | |
|---|---------------------|-------------------------|---------------|-----------------|--------------|---------------------|-------------------------|---------------|-----------------|--------------|
| | Implementation Cost | Data Rate In/Out (Mbps) | Monthly Cost | Annual Cost | Cost Per Meg | Implementation Cost | Data Rate In/Out (Mbps) | Monthly Cost | Annual Cost | Cost Per Meg |
| Current Backhaul Capacity | N/A | N/A | N/A | N/A | N/A | \$ - | 10 / 5 | \$ 37,788.00 | \$ 453,456.00 | \$ 2,519.20 |
| Provide Australian equivalent level service within 3 years. | \$ 7,820,000.00 | 155/155 | \$ 31,500.00 | \$ 378,000.00 | \$ 101.61 | \$ 350,000.00 | 140/25 | \$ 240,000.00 | \$ 2,880,000.00 | \$ 1,454.55 |
| Increase Backhaul Capacity in line with NBN Co Delivery Model - 10 year timeframe | \$ - | 622/622 | \$ 56,700.00 | \$ 680,400.00 | \$ 45.58 | Not Capable | | | | |
| Increase Backhaul Capacity in line with NBN Co Delivery Model - 30 year timeframe | \$ - | 2488/2488 | \$ 103,000.00 | \$ 1,236,000.00 | \$ 20.70 | Not Capable | | | | |

Comparison of Cost of provision of Australian equivalent level service over time.

| | Fibre | | | | Satellite | | | |
|-----------|---------------------|-------------------------|---------------|------------------|---------------------|-------------------------|-----------------|------------------|
| | Implementation Cost | Data Rate In/Out (Mbps) | Annual Cost | Total Cost | Implementation Cost | Data Rate In/Out (Mbps) | Annual Cost | Total Cost |
| Year 1 | \$ 7,820,000.00 | 155/155 | \$ 378,000.00 | \$ 8,198,000.00 | \$ 350,000.00 | 140/25 | \$ 2,880,000.00 | \$ 3,230,000.00 |
| Year 2 | \$ - | 155/155 | \$ 378,000.00 | \$ 8,576,000.00 | \$ - | 140/25 | \$ 2,880,000.00 | \$ 6,110,000.00 |
| Year 3 | \$ - | 155/155 | \$ 378,000.00 | \$ 8,954,000.00 | \$ - | 140/25 | \$ 2,880,000.00 | \$ 8,990,000.00 |
| Year 4 | \$ - | 155/155 | \$ 378,000.00 | \$ 9,332,000.00 | \$ - | 140/25 | \$ 2,880,000.00 | \$ 11,870,000.00 |
| Year 5 | \$ - | 155/155 | \$ 378,000.00 | \$ 9,710,000.00 | \$ - | 140/25 | \$ 2,880,000.00 | \$ 14,750,000.00 |
| Year 10 * | \$ - | 155/155 | \$ 378,000.00 | \$ 11,600,000.00 | \$ - | 140/25 | \$ 2,880,000.00 | \$ 29,150,000.00 |

* Assumption of no changes to service charges

Service Delivery Comparison - Fibre Vs Satellite

Comparison of capability for delivery of service across Fibre and Satellite backhaul links.

Assumptions made:

1. Satellite Capacity upgraded to 140Mbps by 25Mbps. Cost of Implementation = \$350,000.00. Annual Cost for Service = \$2,880,000.00

2. Fibre option implemented with STM1 service (155Mbps by 155Mbps). Cost of implementation = \$7,800,000.00. Annual Cost for Service = \$378,000.00

| Capability | Fibre | Satellite |
|--|---|---|
| Service resilience | Excellent. No outages expected | High. Service will degrade or become inoperable during Solar interference and very bad weather or high wind periods. |
| Fast service restoration capability in the case of severe interruption | Excellent. Capability to provide fully diverse route exists. | Low/Medium. Restoration timeframes are in terms of days or weeks in worst case scenarios. |
| Upgrade capability in line with NBN Co 30 Year Plan | Excellent. Clear upgrade capability exists from the date of implementation with costs already provided for backhaul capability up to 2.4Gbps. Ongong operational costs is highly competitive with cost for backhaul at \$20.70 per Meg. | Low. Capability to expand by a futher 140Mbps via second satellite dish estimated to cost a further \$350,000.00. Expansion past this point estimated at \$1,000,000.00 per 140Mbps. Ongoing operational cost is extremely high with cost for backhaul in excess of \$1,400.00 per Meg. |
| Provide low latency services. | Excellent. 40ms maximum latency expected between Norfolk Island and Point of Interconnect | Low. Worst case latency model with median round trip times expected to be 550ms between Norfolk Island and Point of Interconnect |
| Capacity for Education services | Excellent. Low cost of upgrade paths ensures long term capability for high speed Education links in line with Australian Education policy requirements. | Medium/High. Capacity likely to be adequate but expensive for the short to medium term (5 to 10 years). Longer term capacity is not likely to match requirement. Latency may also cause issues. |
| Capacity for e-Health services | Excellent. High speed, low latency services provide opportunity for provision of inbound Health services for the community as well as outbound eHealth services for the Teleworker market. | Medium/High. Capacity likely to be adequate for inbound e-Health services in the short to medium term although latency may cause issues. Latency known to cause issues for teleworker market and long term capacity is not likely to match requirement. |
| Capacity for business and employment (teleworker). | Excellent. High speed, low latency services provide opportunity for business expansion into Norfolk Island with inter-business links and teleworker opportunities well provisioned for. | Low/Medium. Although bandwidth capacity relatively good, high latency services are a major disincentive for business when examining business opportunities. |

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Report for Norfolk Island Administration

Review of Telecommunications Competition on Norfolk Island

December 2010

1 Updates in this revision

Rev C : Final formal release. Incorporating discussion with Norfolk Island Minister for Telecommunications and Tourism and associated Administration members

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Abbreviations

| | |
|--------|---|
| ACCC | Australian Competition and Consumer Commission. The general competition regulator in Australia. |
| ADSL | Asynchronous digital subscriber line, a copper wire based digital-transmission access technology with a higher download data rate (or speed) than its upload data rate. |
| C Band | Is a satellite transmission protocol operating at 3.7- 6.4 GHz, which can operate through rain and more adverse atmospheric conditions. |
| DSL | Digital subscriber line data transmission technology based on two copper wire pairs between the end-user and the local exchange, having increasing data rates as the technology has developed (e.g. ADSL, ADSL2, ADSL2+, VDSL, HDSL, XDSL, and others). |
| GSM | Group System Mobile, a standard for cellular mobile technology developed in and for Europe, now used internationally. |
| GST | Goods and services tax. |
| IP | Internet protocol is a data transmission standard which has become a widely adopted transmission technology. |
| IPTV | Television signals provided over internet protocol, usually over the internet. |
| K Band | Satellite transmission protocol operating at 11-14 GHz which cannot operate effectively through rain and more adverse atmospheric conditions. |
| Mobile | Cellular mobile phone technology. |
| NGN | Next generation network switching platform based on IP |
| PSTN | Public switched telephone network. |
| SMS | Short message service or text messaging using cellular mobile phones. |
| TNZ | Telecom New Zealand. |
| UMTS | Universal Mobile Telecommunications System. A more technical definition of the 3G mobile network typically used in Australia |
| VoIP | Voice over internet protocol, the use of computers connected to the internet to allow end-users to teleconference or video conference long distance without using the switched telephone networks. |
| VPN | Virtual private network. |
| 3G | Third generation cellular mobile technology. |

2 Executive summary

2.1 What are the objectives of competition

Following the microeconomic reforms in the Australian telecommunications and electricity industries during the 1990's, and the successful introduction of various forms of competition into these industries, considerable debate developed over the best approach to improving economic efficiency in the utilities sector. Amongst a number of well respected economists, Stephen King, Joshua Gans and Rodney Maddock, published a book on the microeconomics of utility competition, which as a central pillar showed using microeconomic theory that the most economically efficient way to provide utility services was through a monopoly.

Nonetheless, it was clear even by the mid 1990's the introduction of competition into the utilities sectors in the Australian economy was a success and was providing significant benefits to the Australian consumer. The reasons explained in the book related to many issues, but of primary importance were the starting inefficiencies of the incumbent utilities, their slow adoption of new technologies and management structures, the poor service quality performance of the incumbents, the pent up demand from consumers for better performance and new products and services, and the relatively large size of the economy. Competition seemed to be and was later shown to be the best approach.

In our view the primary objective of competition in the telecommunications industry is to allow choice between service providers which leads to:

1. improved customer service experienced by end-users, eg: more accurate billing, more timely fault rectification, faster connection, experienced and helpful call centres, and others;
2. access to innovation in services such that new technologies and service types are available to meet the needs of end-users, e.g.: cellular mobile voice and data services, SMS services, broadband internet access, mobile handset internet access, VoIP, IPTV and others; and
3. reduced cost base for delivery of services so that prices either a) need not rise at a faster rate than would otherwise be reasonable, b) can remain stable, or c) can fall over time.

As discussed above, King et.al¹ suggested that these objectives can be met by a monopoly service provider where there are incentives in place to encourage these outcomes and where the profit motive is not a primary incentive. King later became a Member of the ACCC, and has frequently supported the new entrant in the many debates and disputes arising from the microeconomic reforms in Australia.

The primary reasons that the introduction of competition was successful in Australia do not exist in the Norfolk Island micro island economy. Therefore the premise adopted by many policy makers that "competition is best" falls apart in Norfolk Island. In this instance the detail of such introduction must be considered in a wider context and its potential impacts on this small community need to be fully understood before this course of action is taken.

It is our view that each of these outcomes usually ascribed to the successful introduction of competition can be achieved by Norfolk Telecom under its existing monopoly arrangement, but with a considered focus on the objectives of the Norfolk Island community, and the

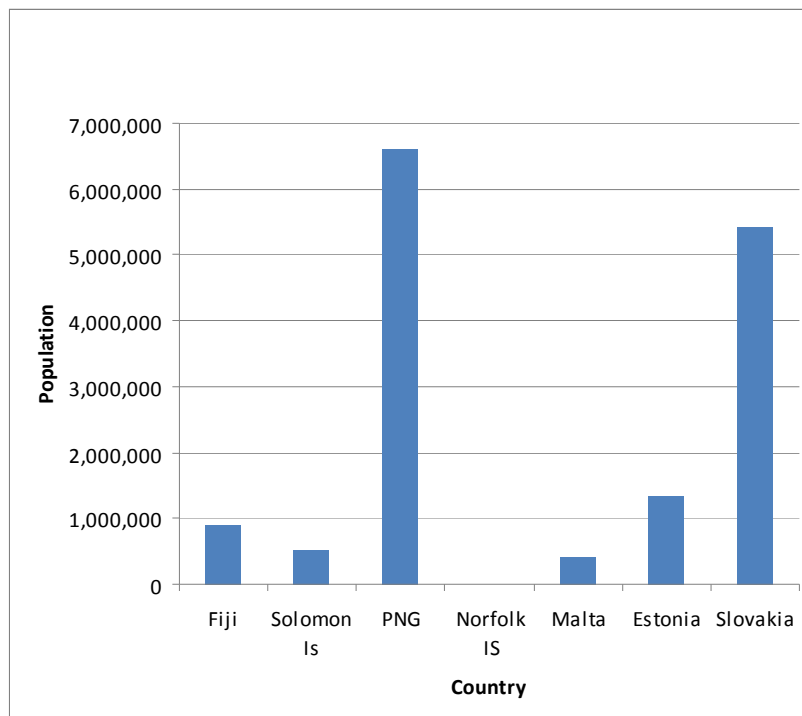
¹ Stephen King, Joshua Gans, Rodney Maddock, *Unlocking the Infrastructure*, [1996].

communication of these objectives to Norfolk Telecom, so that it can meet the objectives of the community it serves. This focus can only exist in a government owned and controlled business, whose primary goal is not profit maximisation.

2.2 Size of the market

Economic literature on the introduction of competition into “small economies” exists and particular examples are in the emerging eastern European countries seeking to qualify for entry into the European Union such as Estonia and Slovakia. Economic publications on “small island economies” also exist, and the focus on a study undertaken on Malta.

Figure 1 – Relative Size of Economy



Other small pacific island economies in which competition has recently been introduced (that is have more than one primary service provider) include Fiji, Papua New Guinea, and the Solomon Islands. The relative size of Norfolk Island is provided in the graph above and it cannot be described as anything other than a “micro island economy”. It is orders of magnitude smaller than the best documented study, which is on Malta. Its population is very much less than the number of fixed line subscribers normally serviced by a single modern local exchange on the Mainland.

2.3 Current position

Norfolk Island is an external Australian Territory with an on island population of approximately 1,800 people. Its political relationship with mainland Australia is complex, beginning when the Island was given by Queen Victoria to the ex Pitcairn Islanders as a new home in 1856.

In general social terms it could be said that while clearly also having strong social, commercial and cultural connections to the Australia mainland² it is without question a very separate island community.

² There appears some debate as to if Norfolk Island should be referred to as ‘Australia’ or not. As such in this report we when we are referring to the Australian mainland we say either ‘Australian Mainland’ or ‘Mainland’. When referencing Norfolk Island we refer to ‘Norfolk’

As Norfolk has no direct Taxation system, it is difficult to calculate exact CPI and GDP measures but Government estimates³ suggest a level similar to that of the Mainland. With a population of approximately 1,800, the following statistics have been provided:⁴

Table 1 – Key indicators of Telecommunications infrastructure

| Region | % of DSL subs | % of mobile subs | % of PSTN |
|---------------|-------------------|------------------|-----------|
| Norfolk | 82% households | 83% | 139% |
| Aust Mainland | 75% of households | +100% | 100% |

It can therefore be seen that in very general terms, the level of service offered to the Norfolk community is comparable to that offered to the Australian mainland.

Norfolk Telecom appears to be the only legal⁵ provider of telecommunication services on the island. Given the size (both in terms of geography & population) of the market, this is consistent with world best practice, where there is no example of a country/economy of similar size where competition is implemented in the telecommunications space.

All legal international connectivity is via a satellite connection to New Zealand where Telecom New Zealand (TNZ) provides both Internet and voice connectivity. Due to the high fixed costs with providing this international connectivity, Norfolk is at both a technical and commercial disadvantage when compared to the mainland. As a consequence of this very high fixed cost, the pricing of voice and data rates cannot be logically compared to that of Mainland Australia or any other large market.

The price of Norfolk services can be compared to that of other small island nations however who have similar (but it should be noted larger market sizes than Norfolk, e.g. Nauru has a population of 10,000, Cook Islands 13,000) economies of scale when considering international backhaul.

Table 2 – Pricing of voice services

| Call type | Norfolk | Nauru | Cook Islands |
|--------------------|------------------|--------|---------------|
| Mobile – PSTN | \$0.20 to \$0.40 | \$0.30 | \$0.35-0.80 |
| Mobile – Mobile | \$0.20 to \$0.40 | \$0.30 | \$0.35-\$0.80 |
| Mobile – Australia | \$0.40 **2 | \$0.70 | \$0.97 |
| Mobile - NZ | \$0.60 **2 | \$0.70 | \$0.82 |
| | | | |

Notes on the above table:

- 1) Depends on time of day

³ “Norfolk Island Retail Price Indexes 1997-2010”

⁴ based on report from <http://www.oecd.org/> and Norfolk Telecom data

⁵ Based on the consultants non legal reading of the Norfolk Island *Telecommunications Act 1992* it appears that only Norfolk Telecom is allowed to offer Internet and PSTN services to the Norfolk public.

- 2) For peak. Off peak is less
- 3) The Cook Islands data has been converted to AUD.

Based on the rather simple comparative data, the current pricing offered by Norfolk Telecom is at worst equal to or lower than other similar sized pacific markets.

Table 3 – Pricing of Internet Data services

| Service | Norfolk | Solomon Telecom **2 | Cook Island **1 | Australia dodo **4 |
|--------------------------------|---|---------------------|--|--------------------|
| ADSL, 3GB download 1024/768 | \$90 per month, additional data \$0.06 per Mb | \$139 per month**3 | \$92 per month , additional data \$0.15 per Mb | \$50 |
| ADSL install | \$50 | \$191 | \$59 | \$99 |

Notes on the above table:

- 1) Data converted into AUD, from the Cook Island Telecom website <http://www.oyster.net.ck/>
- 2) Based on data from www.telekom.com.sb
- 3) Is for a 128/64 k service with 1 GB download limit.
- 4) It is difficult to compare plans absolutely as none are completely identical. Pricing is from www.dodo.com.au

The above analysis clearly shows there is not a market failure in relation to excessively high prices for services which is severely limiting the use of existing and new innovative services by the Norfolk Island community. This is particularly so given the Island’s micro size and extremely remote location. Nonetheless, there are opportunities of further innovative approaches to pricing which might be considered by Norfolk Telecom to assist the take-up of new innovative services and reduce the isolation of the community from the Mainland, where a balance can be struck between the need to provide surplus revenues to the Administration, the need for revenue to finance Norfolk Telecom’s further investment in modern infrastructure, and the local community’s need for affordable priced telecommunications services.

2.4 Market Gap analysis

The market of Norfolk Island is most unique as it has a first world economy (a per capita GDP similar to that of large 1st world nations) but with a very small population, which is very isolated from other markets and infrastructure.

General analysis (for example Tables 1, 2 & 3 in the previous section) indicates that Norfolk when compared to other Pacific Markets has very competitive price and quality offerings. When compared to mainland Australia however there are some service performance limitations resulting from its extreme isolation and it is thus important to analyse these further.

Service costs associated with International connectivity (International calls & the Internet) are higher than the Mainland. This is consistent with the high cost of satellite bandwidth which is directly related to the volume of traffic generated. While submarine cable is viable for larger markets, it is not economically viable for markets the size of Norfolk⁶. There is currently no economic or technical alternative for Norfolk to get cheaper international connectivity.

⁶ "Report to Australian Government on Satellite Services in the Pacific" *Network strategies*

When comparing the various service offerings of Norfolk Telecom to that of (say) Telstra Australia (an operator that exists in a moderate sized and highly competitive market):

PSTN offering: The Ericsson AXE platform used by Norfolk is identical to that of Telstra. It is noted that Norfolk Telecom has plans in the next 12 months to evaluate upgrading its existing network to a NGN platform.

DSL services: The current ADSL offering is technically similar to that offered by Telstra and the other main Australian carriers. While the speeds and download limits are less, this cannot be fundamentally improved as detailed previously above due to international backhaul limitations relating to the data bit rate (or speed) offered by the satellite service providers.

Mobile: The GSM mobile network currently provided by Norfolk, while not 3G/UMTS, represents a reasonable level of functionality. It provides prepaid and post paid service along with International roaming. While the absence of a 3G network (which enables wireless data services) is certainly a negative it should be noted that the only Pacific Nation outside of Australia and New Zealand with a 3G network is Vodafone Fiji with a population base of approximately 1 million people. It is our understanding that Norfolk Telecom is currently evaluating upgrading its network to a 3G network.

The above gap analysis clearly shows there is not a market failure in relation to technology deployment which is severely limiting the adoption of new and innovative services by the Norfolk Island community. But clearly Norfolk Telecom needs to continue to invest in new and innovative technology when the economics of its implementation allow a reasonable opportunity for deployment, so that new innovative services become steadily available to the Norfolk Island community.

2.5 The effect of current competition

The current competition in telecommunications services which exists on Norfolk Island, appears to be of a nature which is usually described as “cherry picking”. The opportunity for competition arises because the new entrant is able to offer lesser quality services (i.e.: in this instance internet services over a K Band satellite link which can be adversely effected by rain or other weather conditions) over which customers who are more price sensitive seek to run new services such as voice over internet protocol (VoIP) which are substitutes to the voice grade services offered by the incumbent carrier.

The lower prices on offer by the new entrant are a direct result of the use of home-user grade technology rather than carrier grade services (ie: C Band satellite link which is resilient to rain and overcast weather). Lower overheads in technology deployment and the reliance on some (and an expanding subset) of the incumbent infrastructure at low prices, allows cross-subsidisation from the incumbent to the new entrant and hence a lower cost base.

The existence of this cross-subsidy allows a lower price to be charged to some Norfolk Island consumers at the expense of other Norfolk Island consumers who rely on the services provided by the incumbent carrier, Norfolk Telecom.

Of prime concern, is that the international C Band satellite link is a natural monopoly in a micro market like Norfolk Island, and the per unit cost rises as less international traffic is carried and more traffic is diverted to a lower quality K Band satellite by-pass link. This increases the overall cost to the community, by moving the satellite link further away from its minimum efficient scale. This in turn reduces the efficiency of the international connectivity, to the detriment of the Norfolk Island community as a whole.

In addition, the profit which is retained by the owners of the new entrant is no longer available to the community as a whole and the surplus from Norfolk Telecom’s operations

or effective “tax” income otherwise available through the profits passed from Norfolk Telecom to the Administration are reduced, with potential negative long-term consequences.

2.6 Impact if competition was formalised

The policy considerations for the formal introduction of competition into telecommunications service provision in Norfolk Island needs to consider a large number of economic, technical, pricing, financial and legal issues, as well as an Island wide consideration of the impacts on the Island economy through a cost/benefit analysis of the potential outcomes.

From an economic point of view, a duopoly will likely arise from the formal introduction of competition, simply because of the micro market size. The duopoly will then likely settle on a Nash Equilibrium in the provision of service types and volumes and the end result will be less vigorous price competition from a generally higher total sector cost base. There is no guarantee that the resulting duopoly prices will be lower than the current prices provided by Norfolk Telecom, or indeed the current new entrant. There are qualitative arguments that the price must rise because the deployment of two international satellite links and associated infrastructure, where one system is already operating away from its minimum efficient scale, can do nothing other than increase the cost base to be recovered from the Island community.

From a technical point of view, if there are two competing networks operating on Norfolk Island, there will be the need for local interconnection and peering. If interconnection and peering is provided on the Mainland (where there are existing competitive markets for such services, but at a cost), the existing satellite links will have to carry outbound and inbound messages (or packets) to allow just simple “local-to-local” calls, emails or web searches. The “trombone” transmission effect without local interconnect and/or peering will either a) degrade the existing service quality by squeezing more traffic over the existing international capacity, and b) increase the Island’s cost base where additional capacity has to be purchased to improve service quality. Where local interconnect and/or peering is mandated, the additional equipment and infrastructure required will come at a cost and again increase the Island’s cost base. In both instances there is unlikely to be an increase in overall revenues to offset the additional costs which arise.

From a pricing point of view, a duopoly is unlikely to lead to significant price competition in such a small market so the normal benefits to consumers from lower prices, is very unlikely to flow from competition which requires a level playing field, cost based interconnection and peering.

From a financial point of view, any surplus available from the higher sector cost base and under the limited affordability base from the Island community will then be shared between the private owners of the new entrant and the Administration. The effectiveness of the dividend retained by the Administration’s ownership of the Norfolk Telecom, as a tax revenue, will be ultimately diluted. This will benefit a few Islanders to the detriment of the whole Island community. It will also limit the ability for Norfolk Telecom to invest in new equipment and services, which competition would otherwise be expected to deliver. It is unlikely the new entrant will invest to the same level as Norfolk Telecom in order to provide these new and innovative services at a quality level which is acceptable to the general Island community. The diversion of these effective tax revenues is also likely to increase pressure for general increases in the only other form of taxation available to the Administration, ie: GST.

From a legal point of view, the regulatory interpretation⁷ on the intent of s.5(b) of the *Telecommunications Act 1992* appears to be quite clear. All telecommunications services

⁷ Please note neither Strategic Economics Consulting Group (SECG Pty Ltd), nor Challenge Networks Pty Ltd are legally qualified or certified to provide legal advice, and do not do so in this

are reserved to Norfolk Telecom within its network boundaries, and include the installation and operation of payphones and PABX outside the network boundary, and the installation and operation international telecommunications infrastructure which links Norfolk Island to overseas jurisdictions, including New Zealand and the Mainland. Given the micro size of the Norfolk Island market, the degree of competition appears to be limited to computer and IT services, broadcast television services, and retail telecommunications services which need to rely solely on the telecommunications infrastructure provided by Norfolk Telecom.

2.7 How to implement competition

The provisions of s.5(b) of the *Telecommunications Act 1992* provide for various forms of competition, but these do not appear to include the more prevalent parallel infrastructure competition now seen on the Mainland. The types of competition which appear to be supported by the existing legislation are in relation to IT services and retail telecommunications services using fixed network infrastructure. Competition in broadcasting services appears to already exist.

Should the Members of the Legislative Assembly believe additional competition is required it will need to modify the *Telecommunications Act 1992* with the appropriate provisions to re-define the reserved rights of Norfolk Telecom, and to ensure a government owned enterprise is not cross subsidising a private enterprise (to the detriment of the general Island community), the law should only allow access to existing or new communications infrastructure and/or services on a full cost recovery basis.

Please note our analysis strongly suggests additional competition will increase the Island's cost base for telecommunications services and reduce revenues available to the Administration, without significant additional benefits to consumers of telecommunications services.

With the introduction of further competition, there will likely be a need to introduce license fees to carriers, including new entrants, in order to replace the previous dividend stream (one of the reasons why average prices will go up and not down).

2.8 Alternatives to Competition

There are strong and clear alternatives to the introduction of further competition which, when clearly articulated and actively pursued, will lead to better outcomes for the micro economy of Norfolk Island.

The primary pricing measure is to be more innovative in the use of price discrimination to capture the benefits to local consumers otherwise available from additional competition, and without plagiarising the revenue streams needed to assist funding of the Administration. The micro economic arguments for this approach are argued later in this report.

First, tourists and visitors to Norfolk Island are likely to value a call back to the mainland more highly than the local community. Their call volume is low but their desire to communicate is high, so they should be happy to pay a higher rate than a local resident or business who is likely to have a higher call volume and is seeking to maximise time or business opportunity through each call and hence would prefer a lower call price. Thus price discrimination between pre-paid GSM for tourists and local residents can be managed through mobile number range allocation, and between land-line tourists (from hotels and other holiday accommodation), local businesses and local residents via fixed network number ranges. Different prices should apply to different customer segments. Similarly broadband wireless access for tourists could be more expensive than for ADSL access to local residents. Given Norfolk Telecom is a government owned monopoly such pricing

case. However a rational person in abiding by the law must be able to read and interpret and provide its view on what restrictions they believe are being imposed by the law.

practices can be implemented without significant detriment to either local residents or businesses, and for tourists who are such an important part of a sustainable Island economy.

Second, any revenue surplus gathered by Norfolk Telecom after the need for efficient investment should be treated as a tax and thus be utilised for the benefit of the Norfolk Island community as a whole. If there is a community concern over the size of the surplus generated then this issue should be tackled in the normal course of policy development by the responsible Executive Member of the Legislative Assembly. Indeed the size of the surplus generated can be managed reasonably through a combination of price discrimination and regular financial reporting with set targets for investment and for dividend return. The benefits from the efficiencies of a well managed monopoly in this instance (ie: the lower costs to consumers) significantly outweigh any price reductions which would accrue through the introduction of competition (ie: the benefits of competition). This is particularly evident where the surplus captured by one or more competitors to Norfolk Telecom would accrue to the purse of the private owners rather than the public purse through Norfolk Telecom.

2.9 Conclusion

Classic micro economic theory suggests that competition will reduce prices to consumers, increase the introduction of innovative services and improve service quality and delivery. However in the case of Norfolk Island the micro size of the market and its remote location from Mainland connectivity strongly suggest that average prices are more likely to rise and not fall, and the availability of new and innovative services will more likely be restricted following the introduction of further competition leading to a reduction in service offering to the Norfolk Island community.

When compared to island markets of a size an order of magnitude greater than Norfolk Island and with similar restrictions of international connectivity, Norfolk Telecom is providing a service that is very competitively priced with a high level of functionality/service.

If the Island community believes the surplus generated by Norfolk Telecom is too high, then the shareholder should set financial guidelines and targets for Norfolk Telecom so that a low tax environment is enjoyed by the local community, and Norfolk Telecom should adopt innovative pricing structures to capture the advantages which would otherwise arise with additional competition, and ensure these benefits flow to local consumers.

2.10 Answers to specific questions

The Minister requested that the following questions be addressed. A summary is presented here with the detailed analysis provided in the main report.

- 1) Should Telecommunications competition be allowed and/or encouraged by the government?

An efficient and effective Telecommunications service is a key requirement for any isolated community such as Norfolk and it should be a primary aim of the Administration to achieve this. It is our view that this aim is not best achieved with the introduction competition but rather the careful management of Norfolk Telecom as a monopoly.

- 2) Analysis of the impact to Norfolk Telecom communications environment should telecommunications be deregulated on Norfolk Island:
 - a. What would be the steps and requirements to implement competition in a reasonable manner?

Competition cannot be just ‘allowed’ to happen. In order to not significantly damage the total telecommunications offering on Norfolk a number of steps need to be implemented which are summarised as follows:

- *The Telecommunications Act would have to be significantly updated.*
- *A financial framework would have to be put in place for compensation for Norfolk Telecom for the incremental costs which would result from the technical additions necessary for competition. This compensation would be paid for by the new entrant(s).*
- *A regulatory function introduced.*

b. What would be the impact on Norfolk Telecom?

If competition was allowed to just ‘happen’ as is currently the case then the impact is that Norfolk Telecom services would begin to degrade due to NT being unable to fund modernisation and services generally on Norfolk would degrade significantly over time.

c. What would be the impact on Norfolk Island generally?

If competition was introduced that followed the guidelines in this report (which advocates that both the government and NT be fairly compensated for their services) then while there would be no overall step improvement in Telecommunications services, at least it would not have a catastrophic impact on the community.

3) Could a competitor operate in the current environment, and under the current Norfolk Island telecommunications Legislation?

Obviously from a technical perspective there is the possibility that a form of competition could be introduced under the current arrangements (e.g retail competition could be technically supported and might be in compliance with the current legislation) but it would likely be financially unviable. A non legally qualified view would suggest that the current legislation does not allow Telecommunications infrastructure competition however and that any current providers are most likely in conflict with the legislation.

4) If the recommendation is to not deregulate, what process should be followed to disconnect the existing services of private providers that connect to the Norfolk telecom network, and what would be the likely consequences?

This should be reasonably straightforward as the current private providers do not offer any services that are not already able to be substituted by services provided by Norfolk Telecom. There would be no detriment to Customers as they can access the existing services provided by Norfolk Telecom. It would be technically difficult to verify that services reserved for Norfolk Telecom are not being delivered by the current private providers without full and open technical access to the computers and equipment of these private providers. Periodic inspection of such equipment and community pressure to ensure compliance with restrictions on service delivery would be necessary to ensure compliance over time.

- 5) Should deregulation occur, how should the pricing framework be assessed and employed?

The wholesale pricing framework will depend on the type of competition allowed and the rule book which defines the competitive environment (the current Act is likely insufficient to reasonably control the introduction of competition). It will also depend on the operational approach used by the new entrant which must comply with the approved competitive rule book. The primary issues will be to ensure cost based wholesale pricing, without cross subsidies from the incumbent to the new entrant, and in a manner which does not diminish or threaten the 'effective tax' revenues currently available from the telecommunications sector to the Administration.

Main report

3 Purpose of this document

This report was commissioned by the Honourable Andre Nobbs, “Minister for Tourism Industry and Development. – Norfolk Island Legislative Assembly “. The Minister wished the following questions to be addressed:

- 1) Should Telecommunications competition be allowed and/or encouraged by the government?
- 2) Analysis of the impact to Norfolk Telecom communications environment should telecommunications be deregulated on Norfolk Island:
 - a. What would be the steps and requirements to implement competition in a reasonable manner;
 - b. What would be the impact on Norfolk Telecom;
 - c. What would be the impact on Norfolk Island generally?
- 3) Could a competitor operate in the current environment, and under the current Norfolk Island telecommunications Legislation?
- 4) If the recommendation is to not deregulate, what process should be followed to disconnect the existing services of private providers that connect to the Norfolk telecom network, and what would be the likely consequences?
- 5) Should deregulation occur, how should the pricing framework be assessed and employed?

This report is written for the review of the Norfolk Island Legislative Assembly as input into their decision making process.

Following the decision of the Assembly in relation to the introduction of competition, this final version of the report includes amendments and additions in response to comments provided by the Executive arm of government. It provides additional detail from that information provided in the Executive Summary and focuses more on detail associated with the potential implementation of government policy.

4 Economic theory on monopoly and competition

This section of the report is provided to assist readers who have limited formal training in microeconomics so that they have an understanding of the economics which underpins the debate on the effects of competition in telecommunications markets, and for readers who have formal training and experience in the field of regulatory economics and policy development as a gentle reminder of the basics. This section covers the following topics:

- The reasons why in certain circumstances a monopoly can provide goods and services as the most economically efficient pricing level;
- The reasons why monopoly pricing has similar properties as a tax; and
- Approaches to price discrimination which achieve outcomes similar to a competitive market outcome.

Readers may wish to skip this section of the report if it adds no value to their understanding of the debate on telecommunications competition in Norfolk Island.

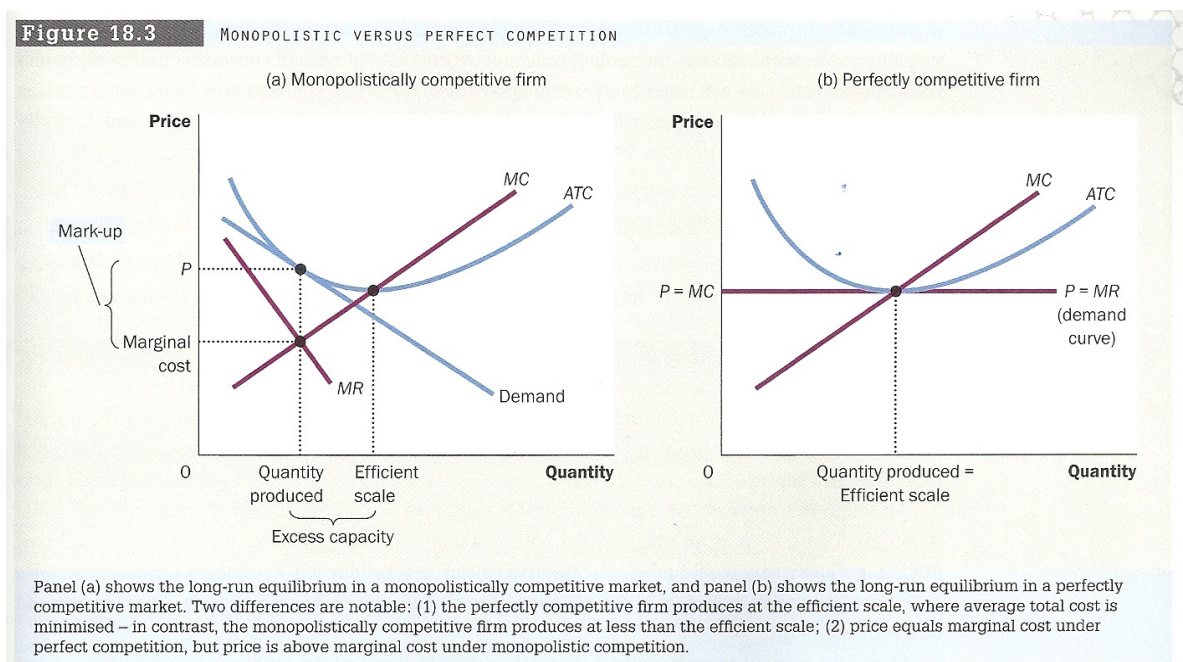
Too often well meaning policy makers or advisers use economic theory to justify the introduction of competition into a market which, when considered on its size and current performance may not be able to sustain such competition.

King et.al⁸ suggested that the objectives sought from economic reform and the introduction of competition can be met by a monopoly service provider where there are incentives in place to encourage these outcomes and where the profit motive is not a primary incentive. Other simplifying assumptions are required which may not always hold in real market situations. Unfortunately this book is no longer freely available and is not longer in print. However, King and Gans (both well respected Australian economists) have published later text books which cover the same issues in greater detail. These are used as a reference source for this section of the report.

The following sections discuss some of the background microeconomics theory which describes the potential impact of a monopoly and drives consideration of the introduction of competition. Comments are also made on why such theory is unlikely to work in a micro-market, such as Norfolk Island, and how Norfolk Telecom’s unique position allows an alternative and viable solution when maintained as a government owned monopoly.

4.1 General microeconomic theory

Basic microeconomics has as one of many, a core concept “... that when you buy a good from a firm in a competitive market, you can be assured that the price you pay is close to the cost of producing that good. If firms are competitive and profit-maximising, the price of a good equals the marginal cost of making that good. In addition, if firms can freely enter and exit the market, the price also equals the lowest possible average total cost of production.”⁹ The same comments can equally to the production of a service. Refer to the right hand side diagram in Figure 18.3 below.



However, central to interpreting this statement, is that the cost of production of a good or service for the economist differs from the cost of production for the accountant. In analysing a firm or industry, accountants only look at the “explicit” costs of production, eg:

⁸ Stephen King, Joshua Gans, Rodney Maddock, *Unlocking the Infrastructure*, [1996].

⁹ Joshua Gans, Stephen King, N.Gregory Mankiw, *Principles of Microeconomics*, 4th Edition, Cengage Learning Australia Pty Limited, 2009, page 309.

the wages cost for technical specialists to run the Norfolk Telecom (NT) network (real cash flows out of the firm), while the economist in making the above statement looks at both the “explicit” costs and the “implicit” costs. The “implicit” costs include all the opportunity costs to the firm which arise from economic activity but which are not measured by the accountant as a cash flow, eg: the wages foregone by NI staff because they work as technical specialists rather than in another occupation.

Gans et.al make the observation that “[an] implicit cost of almost every business is the opportunity cost of the financial capital that has been invested in the business.”¹⁰ Gans et.al make the observation that this is particularly relevant for equity finance which is an “implicit” cost not measured by accountants as a cost to the business, because there is no cash flow cost associated with the equity investment when the accountant measures the firm’s profitability. However for the equity investor such an investment has an opportunity cost because there is a second best alternative investment which would be preferred where the return to equity is less than the return to the alternative investment. The second best investment puts a floor under the minimum sustainable return to equity and this is the opportunity cost to the firm and is included in the “economic costs”. Debt finance on the other hand is an “explicit” cost as the interest payments made by the firm are cash flows which the accountant does take into account when profitability is being measured, and is also included in the “economic cost”. It should be noted, that in the case of Norfolk Telecom, the equity investor is the Administration of Norfolk Island, and by implication all the people of Norfolk Island.

Thus microeconomic theory tells us (given the necessary simplifying assumptions, including such as large markets, many buyers, many sellers, perfect information, and no barriers to entry or exit) that rigorous competition without barriers to entry will drive the prices of goods or services to the minimum average total cost of production.

4.2 Minimum efficient scale

“When long-run average total cost declines as output increases, there are said to be economies of scale. When long-run average total cost rises as output increases, there are said to be diseconomies of scale. When long-run average total cost does not vary with the level of output, there are said to be constant returns to scale.”¹¹

Economies of scale arise when an industry has large fixed costs to get started, and where these costs are averaged on a per unit basis of output, the average total cost curve falls as output volumes rise. The telecommunications sector is a good example of an industry whose base access technology, such as the copper wire access network and parts of the backbone network including towers, masts and satellite dishes, are large fixed costs.

For an industry or firm which displays economies of scale, and at very large output diseconomies of scale, there is clearly a point where the average total cost is a minimum. The quantity of output at this least cost is defined as the ‘minimum efficient scale’. In a general sense, a firm can service its customer base at least cost when it is operating close to the minimum efficient scale. Refer to the right hand side diagram in Figure 18.3 above.

4.3 Pricing for profit

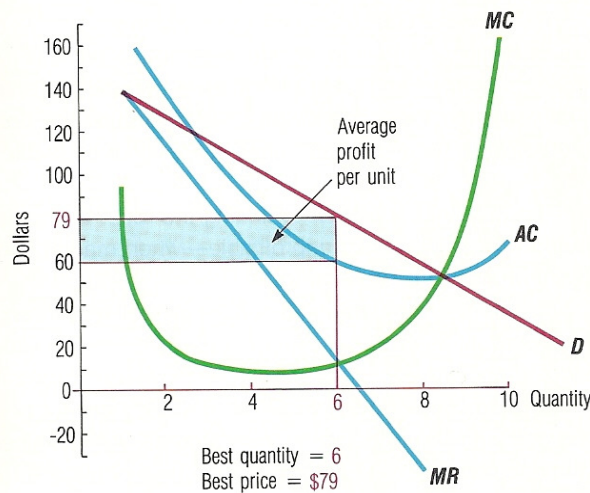
For a profit maximising firm, the objective is to maximise accounting profit. *“To maximise profit, a manager should be willing to supply more units if he can obtain a marginal revenue at least equal to the marginal cost of the extra units. From this we get the following rule for maximising profit: the firm should produce that output where marginal cost is just less than*

¹⁰ Gans et.al, 2009, page273.

¹¹ Gans et.al, 2009, page 285.

or equal to marginal revenue.”¹² Hence referring to the Exhibit 19-15 below, the profit maximising firm will operate at an output level where marginal cost (MC) equals marginal revenue (MR), rather than the economically efficient level derived from a competitive market where MC equals average cost (AC) or average total cost (ATC) where long-run costs are included. The profit would then be measured by the blue shaded area. It should be noted that marketing discussions usually use accounting costs rather than economic costs.

Exhibit 19–15 Alternate Determination of the Most Profitable Output and Price for a Firm



The same situation can be seen in the left hand side diagram in Figure 18.3 above. The profit maximising firm seeks a price above the marginal cost, where the assumptions underlying the ideal competition outcomes which balance supply and demand exactly, do not hold. For example cost or regulatory barriers to entry, or product quality differentiation or other factors allow the firm to charge a higher price which increases their profitability.

4.4 Natural monopoly

*“An industry is a natural monopoly when a single firm can supply a good or service to an entire market at a smaller cost than could two or more firms. For example, an industry is a natural monopoly when there are economies of scale over the relevant range of output.”*¹³

Duplication of the existing fixed copper access network or cellular mobile access network will clearly increase the total base costs to Norfolk Island consumers. Hence the costs associated with two or more firms competing with similar infrastructure will be higher than one firm. Norfolk Island clearly displays natural monopoly characteristics for the delivery of telecommunications services. In other larger markets the notion that the telecommunications sector is a natural monopoly has fallen away. This is primarily because the additional duplication of infrastructure occurs for certain network elements, but is not complete duplication of the whole network. Therefore only certain elements of the networks remain as pure monopolies, eg: termination to a fixed line or a mobile handset remain as network elements which cannot be bypassed by the access seeker.

While larger telecommunications markets, eg: Australia or New Zealand, can support multiple carriers competing and investing sustainably, Norfolk Island is a market which is

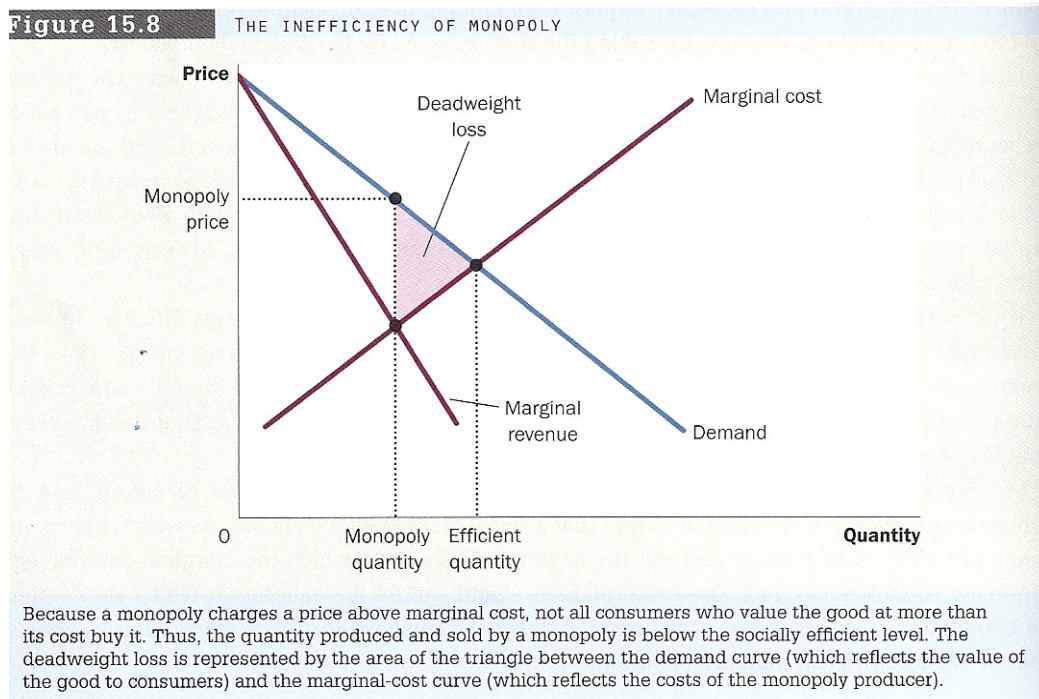
¹² E. Jerome McCarthy, William D. Perreault, Jr., Basic Marketing, 9th Edition, 1987, page 501.

¹³ Gans et.al, 2009, page 318.

substantially smaller (it is a micro market) and can support only one carrier sustainably. Even with the smallest sized modern telecommunications switching equipment it is unlikely that the Norfolk Island telecommunications market could support more than one carrier (providing carrier grade services) in a financially sustainable manner, and even then it is likely to be operating far away from the minimum efficient scale of modern and near future telecommunications technology. For example a fixed network switch or a mobile group switch, can now service significantly above 60,000 simultaneous calls, and in many cases above 100,000 simultaneous calls. With a population of [2,500] and an itinerant tourist population of [1,000], Norfolk Telecom has efficient and modern equipment which is operating at way less than the total capacity of calls which it could support. In this sense, the Norfolk Island telecommunications market can be seen to be a natural monopoly.

4.5 Monopoly pricing & Dead Weight Loss

The one fear that economists have is that where a natural monopoly exists and where it is a profit maximising firm, the natural tendency will be for the firm to reduce its output to the monopoly level where MC equals MR. At this quantity, there is said to be a dead weight loss (DWL) to the economy as a whole, and the higher price available to the monopolist would lead to some demand not being serviced, whereas a lower price would mean that more consumers could buy the product or service. The DWL is shown by the shaded area in Figure 15.8 below.



4.6 DWL is not a social cost in NI

Gans et.al make the following observation about the distribution of the “pie” between consumers and producers. *“It is tempting to decry monopolies for ‘profiteering’ at the expense of the public. And, indeed, a monopoly firm does earn a higher profit by virtue of its market power. According to the economic analysis of monopoly, however, the firm’s profit is not in itself necessarily a problem for society. ... Whenever a consumer pays an extra dollar to a producer because of the monopoly price, the consumer is worse off by a dollar, and the producer is better off by the same amount. This transfer from the consumers of the good to the owners of the monopoly does not affect the market’s total surplus [ie: the pie] ... it merely represents a bigger slice for the producers and a smaller slice for*

consumers. Unless consumers are for some reason more deserving than producers ... the monopoly profit is not a social problem."¹⁴

"The problem in a monopolised market arises because the firm produces and sells a quantity of output below the level that maximises total surplus. The deadweight loss measure how much the economic pie shrinks as a result. ... [If] the high monopoly price did not discourage some consumers from buying the good, it would raise producer surplus by exactly the amount it reduced consumer surplus, leaving total surplus the same as could be achieved by a benevolent social planner."

The microeconomic textbooks used for undergraduate training in economics, usually lead the reader to the conclusion that where a monopoly exists, the monopolist will always exploit its market power to maximise profit. Therefore society is worse off as a result. This is the first inescapable but erroneous conclusion, given the assumptions required to be made to simplify the analysis or to allow for it to be readily understood. This erroneous conclusion is then translated into the decision that the introduction of competition into a monopoly situation itself must always improve economic efficiency. Unfortunately these conclusions are flawed in circumstances where the required simplifying assumptions do not hold, and this is particularly the case for small markets, such as exist on Norfolk Island.

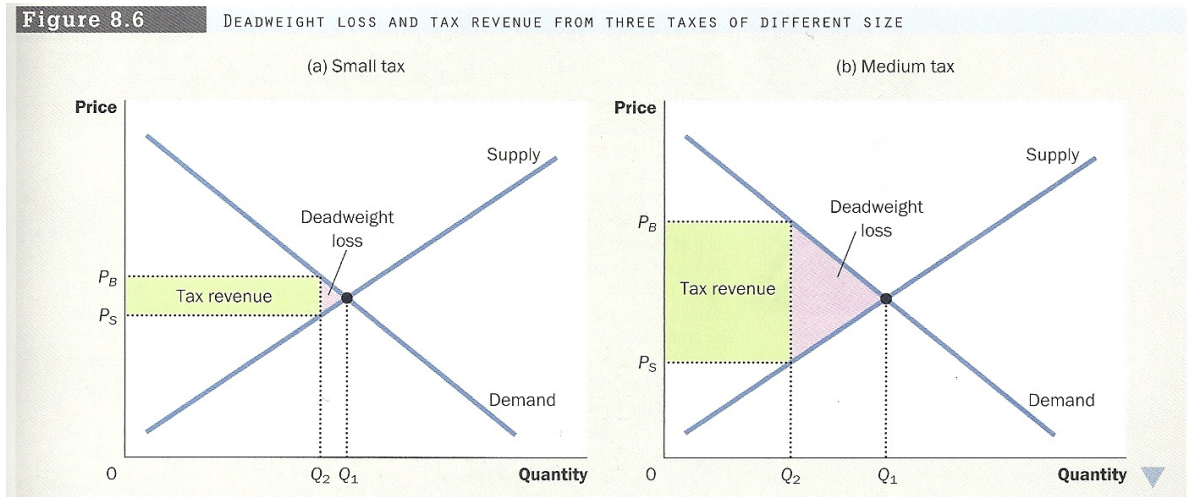
If competition is not to be introduced, and a monopoly firm is allowed to provide services at the lowest cost possible, the second inescapable conclusion, again erroneous, is that the monopoly then needs to be regulated. Research by Demsetz suggests a number of things with respect to the regulation of monopolies. First is that the *"theory of natural monopoly is deficient for it fails to reveal the logical steps that carry it from scale economies in production to monopoly price in the market place."*¹⁵ He argues that if open tendering is used to appoint a monopoly, eg: for a franchise area for a defined period of time and for defined services, the deadweight loss can be shown to be diminished to close to zero which is the outcome available from a fully competitive market. Two assumptions are required and these are that inputs to production are available to all bidders, and the costs of collusion are prohibitively high. Second is that the need for a regulator (or commission) is diminished where tendering for a monopoly exists because the *"restraint of the market would be substituted for that of the regulatory commission."* He further argues that where assets in a monopoly situation are long lived, and not community assets, the lack of re-tendering opportunity *"may give support for some sort of regulation"*. *"In such cases it may be desirable to employ a cost-plus regulatory scheme or to enter a clause which reserves the right, for some fee, to renegotiate the contract."* For government owned assets, such regulation and/or re-contracting can be achieved through a mandate from the owners of the assets for a change in the price which would otherwise be achieved through some form of competition.

4.7 Tax and Dead weight Loss

In the same way that a higher price than the [Nash Equilibrium] generates a Dead Weight Loss(DWL), a tax on a good or service (such as a Value Added Tax, VAT, or Goods and Services Tax, GST), also increases the price to generate a DWL exactly as shown above in Figure 15.3. This is more clearly shown in the Figure 8.6 below.

¹⁴ Gans et.al, 2009, page 329.

¹⁵ Harold Demsetz, *Why Regulate Utilities?*, Journal o Law and Economics, Vol. 11, No.1 (April 1968), pages 55 – 65.



As Gans et.al indicate, the “deadweight loss – the reduction in total surplus that results when the tax reduces the size of a market below the optimum – equals the area of the triangle between the supply and demand curves. For the small tax in panel a), the area of the deadweight loss triangle is quite small. But as the tax rises in panel b) ..., the deadweight loss grows larger and larger. Indeed, the deadweight loss of a tax rises even more rapidly than the size of the tax ... [because it] is the area of a triangle, and an area of a triangle depends on the square of the size of the tax.”¹⁶

This issue is important for Norfolk Island, because we understand the primary local tax revenue which is derived from the community to fund the Administration, is through a GST of 12.0 %. The public ownership of Norfolk Telecom means that any dividends paid from revenues above the economic cost to provide these services and that component of the economic cost related to the return on equity invested, is effectively nothing more than an additional tax on consumers of telecommunications services, which goes towards the provision of services by the Administration to the community as a whole. In this sense, public ownership is a critical issue for the community of Norfolk Island. Diversion of revenues from Norfolk Telecom would appear to be the same as a reduction in tax revenues.

4.8 Competition in small economies

“Adoption of the law of a large and different jurisdiction has important pitfalls. As this paper demonstrates, the most important is that insufficient weight is given to the special characteristics of the small economy, which differ significantly from those of a large one. Although many economies of all sizes rely on the market as a method to regulate economic activity, where the conditions for the effective and efficient operation of a market differ competition law should take these differences into account. The challenge is thus to adapt the doctrines established in a large market to a smaller market.”¹⁷

“In learning from other competition laws one has to exercise extreme caution given that each legal regime operates in a different economic environment. One should also be wary of conflicting goals. It is thus crucial to define the unique issues which are most important in a small economy context. As this paper demonstrated, many of the policy prescriptions for small economies differ significantly from the standard paradigms of competition policy

¹⁶ Gans et.al, 2009, page 163 – 164.

¹⁷ Michal S. Gal, Market Conditions Under the Magnifying Glass: General Prescriptions for Optimal competition Policy for Small Market Economies, Working Paper #CLB-01-004, Draft 04/13/01, New York University, Center for Law and Business, page 67.

applied in large economies. Small size affects the policy towards mergers by placing much more emphasis on efficiency considerations and less reliance on structural variables alone; It affects the optimal policy in monopolistic markets by requiring less reliance on market forces to erode market power and by placing more emphasis on direct regulation by competition authorities; It also necessitates a stricter and a more strongly enforced competition policy towards oligopolies. In addition, small size affects the accuracy of many of the rules-of-thumb and indicators of market dominance and anti-competitive conduct used in large economies.”¹⁸

“The differences in optimal competition policy between large and small economies necessitate a careful balancing of the interests of different sized economies and the setting of rules that are flexible enough to apply without jeopardizing the special interests of small economies. Otherwise, the costs of such unification may well outweigh its benefits.”¹⁹

4.9 Price discrimination as a substitute for competition

The existence of deadweight loss and in particular the loss of consumer surplus through higher pricing than is necessary for pure economic efficiency, is usually described as a market failure, and is the primary argument used to justify the introduction of competition into a market of any size. However other approaches are available even with the retention of a monopoly and in consideration of the micro markets, where the market characteristics suggest viable competition may not be possible. Part of the solution to improve economic efficiency is the introduction of price discrimination.

Gans et.al suggest that monopoly pricing has the same effect as and indeed can be considered as a tax.

“Just as we measured the inefficiency of taxes with the deadweight-loss triangle ... we can similarly measure the inefficiency of a monopoly. .. [The] area of the deadweight-loss triangle between the demand curve and the marginal-cost curve equals the total surplus lost because of monopoly pricing.”²⁰

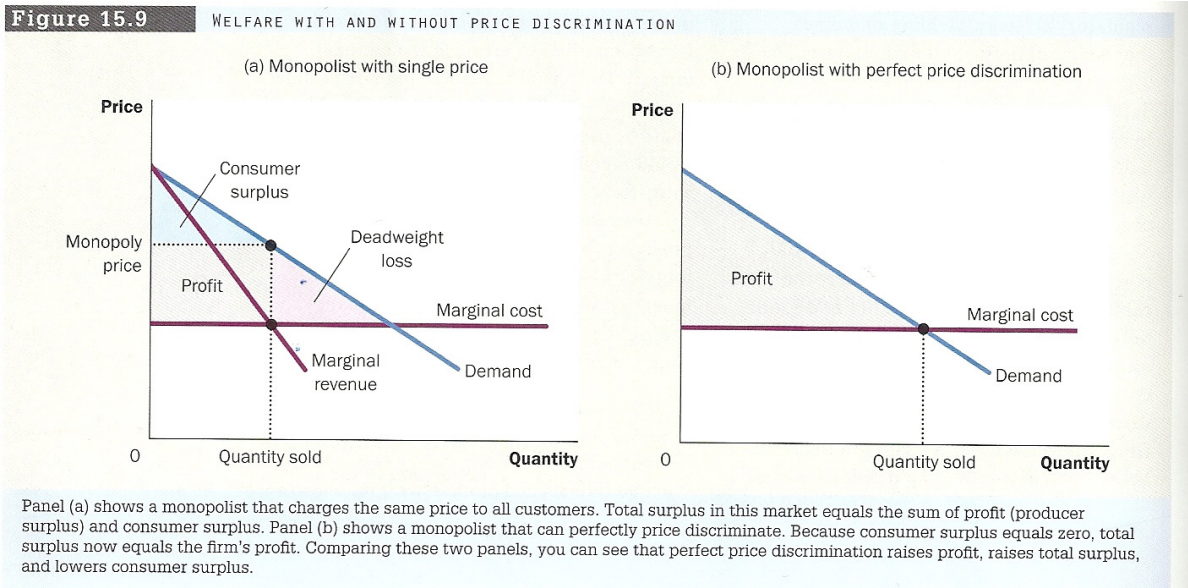
“The deadweight loss caused by monopoly is similar to the deadweight loss caused by a tax. Indeed a monopolist is like a private tax collector.

Gans et.al also suggest that where there is a monopoly and “a firm can perfectly price discriminate, ... customers who value the good at more than marginal cost buy the good and are charged their willingness to pay. All mutually beneficial trades take place, there is no deadweight loss, and the entire surplus derived from the market goes to the monopoly producer in the form of profit.” The Figure 15.9 below demonstrates the possibility from price discrimination, although in practice the pricing efficiency is never perfect so some surplus is forfeit.

¹⁸ Gal, 2001, page 67.

¹⁹ Gal, 2001, page 68, Size does matter.

²⁰ Gans et.al, 2009, page 329.



The message here for NI is twofold.

First, tourists and visitors to NI are likely to value a call back to the mainland more highly than the local community. Their call volume is low but their desire to communicate is high, so they would be happy to pay a higher rate than a local resident or business who is likely to have a higher call volume and is seeking to maximise time or business opportunity through each call. Thus price discrimination between pre-paid GSM for tourists and local residents can be managed through mobile number range allocation, and between land-line tourists (from hotels and other holiday accommodation), local businesses and local residents via fixed network number ranges. Similarly broadband wireless access for tourists could be more expensive than for ADSL access. Given Norfolk Telecom is a government owned monopoly such pricing practices can be implemented without significant detriment to either local residents or businesses, and for tourists who are such an important part of a sustainable economy.

Second, any revenue surplus gathered by NT can be treated as a tax and thus be utilised for the benefit of the NI community as a whole. Indeed the size of the surplus generated can be managed reasonably through a combination of price discrimination and regular financial reporting. The efficiencies of a managed monopoly in this instance (ie: the costs to consumers) significantly outweigh any price reductions which would accrue through the introduction of competition (ie: the benefits of competition). This is particularly evident where the surplus captured by one or more competitors to NT would accrue to the purse of the private owners rather than the public purse through NT.

4.10 Conclusion on economic rationale for competition

We conclude that the normal economic arguments for the introduction of competition in the telecommunications sector in a micro market such as Norfolk Island, do not stand up to rationale and clear thought. The introduction of competition for competition's sake alone, will likely lead to the reduction in tax revenues available to the Administration, a reduction of services provided by the Administration to the local community, and over time the reduction in autonomy of the Norfolk Island community.

What should be of major concern to the Norfolk Islanders, is a situation where the current regulatory settings for large mainland telecommunications markets, such as Australia or New Zealand, are claimed to bring benefits to a microscopic market which is geographically very remote from such mainlands. The transfer of mainland regulatory frameworks will clearly not work in Norfolk Island, and new and clear thinking, as well as significant modification to such frameworks is required, to retain a sustainable and world class

telecommunications infrastructure. The need for an alternative approach developed by and for the local circumstances, has been recognised and exercised in the past, and this should continue. The need for a dedicated regulator is minimal provided the regulatory settings are decided and clearly set out by the Administration (in regulation or law), and provided community norms lead to compliance with the regulatory setting which are adopted.

5 **General discussion around competition types and possible introduction**

Competition in telecommunications services can occur in a number of different ways. The approaches used by different new entrants into the industry depend on the experience and skills of the staff within the new entrant, their perceptions of the opportunities for profit or for community service (NFP²¹ only), and the financial resources they have available for investment.

The following paragraphs briefly describe the ways in which competition typically develops in the telecommunications sector and provides some thoughts on the sustainability of such competition in Norfolk Island. The competition described is for a new entrant who is commercially focused and is seeking an economic return on their investment.

5.1 **Retail, Wholesale and Infrastructure Competition**

Competitive entry into the telecommunications industry can be considered from the separate perspectives of retail, wholesale and infrastructure competition. These dimensions offer different opportunities for new entrants as they allow different degrees of resource substitution and investment by the new entrant.

Retail

Here, the marketing characteristics of new entrant behavior are as follows:

- New entrants show strong marketing skills and differentiate themselves from the incumbent by being more focused on “customer service” and on “advertising and selling”;
- The margins in this environment are slim and the new entrant relies on the volume of sales and a rapid expansion in take-up of new services in order to be profitable;
- The focus is on market segments which the incumbent has not served particularly well and where there is pent-up demand which can be quickly served;
- Also the focus is on market segments where the margins are higher, there is price sensitivity and where arbitrage opportunities exist because of volume opportunities such as in government departments, large corporate or commercial enterprises, or where demand concentration exists such as in high-rise office blocks or commercial business districts;
- Consumer benefit comes through the pricing pressure resulting from the new entrant’s acceptance of lower retail margins than the incumbent, which is required to trigger an exercise of choice by customers in suppliers, and the perceptions by the customers that they are being better served; and

²¹ “Not-For-Profit” (NFP) companies or entities typically seek to meet a community or social goal but usually do not seek a return-on-capital or a return-of-capital on their investment. They are usually not commercially focused to generate a profit and are funded from welfare or charitable organisations rather than from shareholders who might otherwise expect a return on their investment.

- The approach to profitability is on rapid growth and take-up, and on getting customers locked onto mid-term contracts with profitable termination clauses.

Here, the investment characteristics of new entrant behavior are as follows:

- The new entrant re-badges or brands the services offered by the incumbent operator;
- There is little “value-added” by the new entrant in a technical sense, but typically the customer sees a more responsive and customer focused service provider; and
- The investment by the new entrant is minimal and typically includes a shop front for sales, a billing system which allows the new entrant operating as a retailer to “re-badge” the incumbent’s bills or billing records, a complaint and call handling “call centre”, and in staff time for a direct-selling sales force and for management activities.

The support required by the incumbent for the new entry of this type is as follows:

- Provision of services to competitors at a ‘discounted’ retail price which recognizes the substitution of billing and some call centre costs otherwise borne by the incumbent, and through recognition of the potential to grow call and service volumes through more innovative sales and marketing techniques;
- The development of a wholesale billing system, which allows the calls from customers purchasing from the new entrant to be separated from the calls from customers of the incumbent, and typically both a detailed paper record as well as a soft copy of all transactions is required by the new entrant;
- An enhanced complaints handling system, where the complaints received directly from the new entrant’s customers are separated from those of the incumbent and are handed back to the new entrant for initial action, and a secondary complaints system where the “non-billing” or “network related” complaints are funneled by the new entrant to the incumbent for technical solution and feedback; and
- Investment in new number ranges and in exchange conditioning to allow call-by-call tracking of new entrant customers where-ever they are connected, or for mobile customers where-ever they are travelling.

The benefits of retail competition for consumers are typically lower prices for price sensitive customer segments, an ability to find and sell to pent-up demand, and the commencement of a process where customers paying above the underlying cost structure begin to see price reductions. The latter of-course means that cross-subsidies between customer groups begin to unwind. There is usually little or no development of new service offerings as the technical delivery relies on the incumbent service offerings, but there is development of innovative ways to deliver pricing packages which better meet customer’s economic circumstances.

The above form of competition relies on margin arbitrage, and willingness by the incumbent to provide margin opportunities, or a lack of customer understanding or focus such that the new entrant can recognize margin opportunities which are overlooked by the incumbent. This competition is typically transient, and disappears as the incumbent better understands its customers, begins to price competitively to customer segments which are willing to exercise choice in supplier, and begins to be more responsive to customer needs (including

development of new products and services, more accurate billing and more timely resolution of complaints).

There are few advantages to the incumbent from this process. The incumbent would need to invest in wholesale billing systems and in enhanced call centre processes and systems to allow competition to work. Even when these activities are provided in an efficient manner and are efficiently priced to competitors, the costs incurred are above those required by monopoly service provision but nonetheless are eventually recovered from the end-user consumers. In markets where there is little growth, there may be limited benefit to the economy where the cost base of the sector increases, but growth in the types of services offered – and growth in the volume of use – is insufficient to increase sector net revenues.

There appear to be very limited opportunities in Norfolk Island for this approach to competitive entry. Given the size of the island retail opportunities (selling phones, scratch cards, etc) is already at saturation and it is unlikely that any competition would add to the level of service or reduce service supply cost.

Wholesale

Here, the marketing characteristics of new entrant behavior are as listed for the retail competitive approach above, plus there is additional emphasis on the following:

- The new entrant claims (say) more accurate and timely billing, is able to enhance billing display by separating department / division costs within large government and business customer accounts, and is able to provide more innovative pricing plans to meet specific large customer needs by having more timely access to call record information; and
- Where the wholesale arrangements allow, the new entrant is able to offer “managed services” to larger customers.

Here, the investment characteristics of new entrant behavior are as follows:

- The new entrant provides some infrastructure (usually in the form of a switch at a single and central point-of-interconnect to directly gather call records and where activated to allow customer service option activation) and continues to rely heavily on the incumbent infrastructure and service provision to originate, transit and terminate the calls;
- Again the new entrant re-badges or brands the services predominately flowing through the incumbent infrastructure;
- There is additional “value-added” by the new entrant through direct gathering of customer call information, and again the customer sees a more responsive and customer focused service provider;
- The direct access to customer billing information and to customer activation can also mean a “managed service” can be offered to government departments and to large corporate entities on an outsourced basis; and
- The investment by the new entrant again typically includes a shop front for sales, a billing system which allows the new entrant using wholesale services to undertake its own billing using “directly collected” billing records, a complaint and call handling “call centre”, and in staff time for a direct-selling sales force and for management activities.

The support required by the incumbent for the new entry of this type is as follows:

- Provision of wholesale services to competitors at a wholesale or ‘significantly discounted’ retail price which recognizes the elimination of wholesale billing systems, substitution for retail billing systems, and some call centre costs otherwise borne by the incumbent, and through recognition of the potential to grow call and service volumes through more innovative sales and marketing techniques;
- The development of a primary (or single point) interconnect and service activation system, which allows the originating calls from customers purchasing from the new entrant to be separated from the calls from customers of the incumbent, and passes these calls across the point of interconnect (POI) to the new entrant for gathering of the call charge record (and for provision of call number redirection and other data base services), and allows the return of the call for termination by the incumbent;
- An enhanced complaints handling system, where the complaints received directly from the new entrant’s customers are separated from those of the incumbent and are handed back to the new entrant for initial action, and a secondary complaints system where the “non-billing” or “network related” complaints are funneled by the new entrant to the incumbent for technical solution and feedback; and
- Investment in new number ranges and in exchange conditioning to allow call-by-call forwarding of new entrant customer calls to the POI where-ever they are connected, or for mobile customers where-ever they are travelling.

The benefits of wholesale competition for consumers are similar to those for retail competition, but with a few additions. There is usually an increased potential for development of new service offerings as the technical delivery is less reliant on the incumbent service offerings (for example 1800 or ‘free calls’ and virtual private network services, “VPN”). Nonetheless these offerings are dependent on the conditioning of the incumbent network to allow delivery of the enhanced calls. Origination and termination still occurs on the incumbent network. This form of competition relies on a combination of margin arbitrage, new enhanced service delivery and managed services. This competition is less transient as the new entrant is more committed than just relying on arbitrage margins to allow commercial viability, and having committed greater investment stays longer to recover this investment. Profitability comes from more efficient operations and delivery of services. In many ways the competition is not focused on ‘mum and dad’ residential customers but relies on a depth of market in the government, corporate and commercial customer segments. The enhanced services offered respond to needs in these customer segments and do not offer much for residential customers.

There are few advantages to the incumbent from this process. They will need to invest in interconnect and network conditioning systems, as well as in enhanced call centre processes and systems to allow competition to work. Again, as with retail competition, even when these activities are provided in an efficient manner and are efficiently priced to competitors, the overall industry costs incurred are above those required by monopoly service provision but nonetheless are eventually recovered from the end-user consumers. Cost recovery and increased profitability for all service providers comes from the negative elasticity of demand expanding the volumes and range of services supplied and in increasing the “pie” or market size of consumer spending on telecommunications services. As also noted in relation to retail competition in the preceding section, in markets where there is low growth, there is likely to be limited benefit to the economy where the cost base of the sector increases, but growth in the types of services offered – and growth in the volume of use – is insufficient

give rise to a commensurate increase in sector revenues. This is a major issue in a “micro” market.

There appear to be limited opportunities in Norfolk Island for this approach to competitive entry, as the government, corporate and commercial sectors are small and are unlikely to have the call usage and revenue generation depth to allow two operators to compete profitably, particularly with the increased cost base. The benefits of new service offerings are again limited as the sectors utilising these are either cash strapped (government) or emergent at best (corporate and commercial).

Infrastructure

Here, the marketing characteristics of new entrant behavior are as listed for the retail and wholesale competitive approaches above, plus there is emphasis on the following:

- The new entrant can offer “large pipe” connections to larger government, corporate and commercial customers, by-passing the incumbent’s “last mile” infrastructure;
- There is investment by the new entrant in long-distance fibre optic transmission infrastructure which allow more efficient delivery of long-distance call and data services and competition into long-distance services; and
- This allows the offering of new data and private network services such as TCP/IP networks integrating voice, data (including internet) and video traffic.

Here, the investment characteristics of new entrant behavior are as follows:

- The new entrant provides more infrastructure (usually in the form of multiple switches and POI at viable high-traffic incumbent exchanges, customer management and service option activation systems, and large-pipe connections between large customers and the new entrant’s point of presence (POP); and additional long-distance transmission capacity, and continues to rely on the incumbent infrastructure and service provision to partially originate and terminate the calls;
- The investment in shop front for sales, a call centre for complaint and service activation, retail billing systems and in customer call records is similar to the retail and wholesale competition requirements, but in addition the new entrant needs more technically qualified staff to install, maintain and operate both “last mile” and “long-distance” infrastructure as well as to effectively run its own network; and
- To the extent the new entrant is able to provide customer ‘access links’ through copper wire or fibre optic by-pass installation (the last-mile investment using xDSL, IP or other) or on fixed mobile infrastructure (using WiFi or other), where such infrastructure could be deployed separately from the incumbent infrastructure.

The support required by the incumbent for the new entry of this type involves the same investment as is required for wholesale competition, plus the following:

- Provision of interconnect services to competitors at a negotiated interconnect price which recognizes the elimination of the long-distance transmission costs, some of the customer access links, the wholesale billing systems, the substitution of retail billing systems, and most call centre costs otherwise borne by the incumbent, and through recognition of the potential to grow call and service volumes through more innovative sales and marketing techniques, as well as new service provision; and

- The development of primary (or multiple point) interconnect which allows competition in long-distance voice call carriage, and secondary interconnect through allowing access to basic “unmanaged” infrastructure (such as unbundled copper pairs from the customer to the local exchange so DSL access can be deployed), where the new entrant only pays for the interconnect or wholesale services it uses, and “any-to-any” customer connections are supported for all of voice services, SMS services, and e-mail services.

The benefits of infrastructure competition for consumers are similar to those for retail and wholesale competition, but with a large number of additions. There is usually very strong pressure on retail prices and very strong competition in developing and deploying new services. The need for “any-to-any” connectivity and hence for origination and termination services based on cost is required for both the new entrant and the incumbent network. This form of competition relies on a combination of new entrant access to lower infrastructure cost and more efficient operation, service innovation and speed-to-market for new services, and much less on margin arbitrage. This competition is not transient as the new entrant is more committed to commercial viability, and having committed much greater investment stays longer to recover this investment. In many ways the competition is focused on all customer segments including ‘mum and dad’ residential customers where this makes economic sense. But its development and initial focus is still on high margin services and on a depth of market in the government, corporate and commercial customer segments.

There are much less advantages to the incumbent from this form of competition. They will need to invest in interconnect and network conditioning systems, as well as in enhanced call centre processes and systems to allow competition to work. These investments are required at multiple locations throughout their network. Again, as with retail and wholesale competition, even when these activities are provided in an efficient manner and are efficiently priced to competitors, the total costs incurred for the whole industry are above those required by monopoly service provision but nonetheless are eventually recovered from the end-user consumers. Cost recovery and increased profitability for all service providers comes from the negative elasticity of demand expanding the volumes and range of services supplied and in increasing the “pie” or market size of consumer spending on telecommunications services. The same issue applies in the case of infrastructure-based competition, as in retail and wholesale competitive models discussed in the sections above – that where there is low growth, there may be limited benefit to the economy when the cost base of the sector increases, but growth in the types of services offered and in the volume of use is insufficient to increase sector net revenues. This is a major issue in a “micro” market.

There are superficially some competitive opportunities in this space:

- 1) Provision of ‘last mile’ DSL and WiFi services. This is due to pricing arbitrage where access to the copper is not priced at true cost, thus enabling competition to price below that of the incumbent.
- 2) Supply of lower cost international connectivity by virtue of providing a lower quality service (which the incumbent is not able to offer due to the nature of it being requiring to provide a high availability voice-grade service) and not having to cross subsidize low/zero profit services (ie: local PSTN access and calls).

These two forms of “inefficient” competition appear to exist on Norfolk Island and there are significant concerns that they are not sustainable in this “micro” market.

5.2 National vs International Margins

Historically, competition in telecommunications markets develops first by new entrant competitors seeking high margin segments of the telecommunications markets.

International

One of the highest margin telecommunications services is the International long-distance voice call, both outgoing and incoming calls. For many decades prior to the 1990s, the high margins available in these services provided the excess cash flow for developing countries to cross-subsidise the roll-out of basic access to the non-urban and Rural areas.

In more recent years, the margins for these services have shrunk considerably, particularly in developed countries, for a number of reasons including:

- For both outgoing international call origination and incoming international call termination:
 - The introduction of competition in local and national call carriage in developed countries, including the issuance of licences to new entrants which encourage alternative international circuit investment (hence alternative traffic pathways) and allow competition in international call carriage ;
 - Through technological developments such as TCP/IP and the Internet which have allowed by-pass of long-distance metered calls through the use of VoIP ;
 - Through service substitution where new technologies and their take-up have provided cheaper alternative means of communication than metered voice calls, for example the SMS / text message through GSM mobile networks, and via e-mails using the Internet ;
 - By the use of special number ranges and calling card services allowing call-back using cheaper international origination and allowing call re-direct to by-pass calls through larger countries with more call volume and hence lower unit interconnect or termination costs ; and
 - In general terms there is little relationship between distance and cost. With the advent of high bandwidth international fibre trunks the incremental cost associated with distance is negligible (this does not mean the overall cost is negligible, only that the marginal cost is low).
- For incoming call termination :
 - Use of international call transmission techniques such as call refile, call transit and circuit compression which take advantage of differing interconnect rates and international circuit capacities to reduce overall call delivery costs ; and
 - Commencing in 1998, from pressure by the Federal Communications Commission (FCC) of the USA on US carriers to not accept termination rates into other countries above FCC mandated benchmarks (such benchmarks being set in US\$/min terms and being graded according to the GDP per capita and fixed telephone-network line-density of the terminating country).

In less developed countries (particularly micro-island countries), the effect of these pressures has been delayed but is slowly reducing international call termination rates. Also there is a recognition by the international telecommunications community that the benefits seen from the introduction of competition (either through issuance of international licences, or national licences, or both) are unlikely to result in significant reductions in international termination rates and by inference interconnect rates at the national level, because the high fixed-costs and the lumpy and upfront nature of the infrastructure investment combined with low call (and traffic) volumes precludes significant interconnect rate reductions. Conversely this means opportunities for significant retail rate reductions are also limited.

There is also a strong difference between developed and developing countries with respect to the completeness of their initial network roll-out (whether fixed network or now increasingly a focus on mobile network). Most developed countries already have better than 80% fixed network penetration, and in many instances have close to 100% penetration, of fixed networks. In many instances they now also have very high mobile network penetration (now in many instances being higher than the fixed network penetration) and high cable network penetration. As a result there is less focus on universal access by customers, but now a focus on service development and price reductions for the benefit of consumers. This is possible because of the large market size, large call and traffic volumes, and the overall industry size by country which allows private (or government) investment at the same time as new competition and competitive entry is encouraged.

In less developed countries this is not the case. The fixed network penetration is usually quite small (typically less than 10%, and for micro-island nations much less than 10%). Thus the customer “access” investment in fixed networks is not yet complete, and now may never be completed. The differential cost in roll-out of fixed versus mobile networks has meant that over the last decade, the investment in the less developed countries has usually gone into mobile network deployment rather than fixed network deployment as the unit costs are lower, and hence retail prices are more affordable. In many instances this means the universal access goal of many developing and micro-island nations will never be met by fixed network deployment without the ability of the carriers in these countries to utilise higher international call margins to cross-subsidise access investment. This inability to achieve the universal access goal will also mean the full economies of scale from their network investment (whether fixed or now more likely to be mobile network) are unlikely to be achieved within the economic life of the assets deployed.

National

On the Mainland, along with access to the international long-distance market, the other primary market for new entrants was the national long-distance market. The Incumbent retail call tariffs in this market provided the second largest margin for which an efficient new entrant could compete to gain market share and build a financially viable business. The history of new entrants on the Mainland, shows a progression from ‘wholesale’ to ‘infrastructure’ activities (as described above), with the move to infrastructure investment in either the national long-distance market or the high-capacity fibre-optic corporate access market. Such national long-distance markets are sometimes available in small island states with a large number of dispersed islands, but not in a micro single-island state such as Norfolk.

Small and Micro Island

Pacific island countries tend to have one of two characteristics, they either have multiple small islands which are populated to varying degrees with a capital city on the main island, or they are single island states. Where there are multiple islands, national long-distance traffic exists, from island hops using microwave (for closely spaced islands), submarine cables (for shallow and closely spaced islands), to satellite links for islands separated by large distances or by deep water trenches. Norfolk is a single island state and as such there is no concept of national long-distance calls and hence this market is not available for competitive entry.

As a micro-island nation, Norfolk Island has a number of disadvantages which underpin the costs of its international call costs including an inability to own satellite infrastructure and very small international outgoing or incoming call volumes due to lack of international trading and export markets.

As a result of the above discussion, it is clear that the first choice of the introduction of competition is in relation to the market for international calls. This has already been seen with NIDS offering International call bypass for some years. Other forms of competition are

not likely to be viable, simply because the size of this micro market is well below the minimum efficient scale of modern switch technology, there is no long-distance or differential pricing used on the island (because it is geographically small), and the small market size is unlikely to provide much more revenue growth related to the telecommunications share of household expenditures, than has already been experienced with the introduction of cellular mobile and internet networks to the Island.

5.3 Mobile vs Fixed

Until the late 1990s, fixed subscribers in most developing countries outnumbered mobile subscribers. In recent times mobile network infrastructure economies of scale have been greater than for fixed networks due to there being no requirement for 'last-mile' copper investment. Now the majority of countries have mobile subscribers that are significantly in excess of fixed subscribers. The reasons for the emergence of this characteristic are as follows:

- Fixed network roll-out, on a per customer basis, is relatively more expensive than cellular mobile roll-out (although mobile network roll-out nevertheless involves high cost);
- Fixed network services are more prone to vandalism, theft, sabotage and corrosion, than mobile services;
- It is more expensive to maintain a copper network than a cellular mobile network;
- Cell sites are easier to power, secure and maintain than terrestrial networks;
- Mobile networks can cater for customer growth and are faster to activate subscribers than terrestrial networks; and
- Usually mobile handsets are cheaper than the alternative fixed customer access line combined with the cost of customer premise equipment (CPE).

Interpreting the above general characteristics of mobile services and the particular issues facing these services in Norfolk Island, it is considered that average margins of mobile services are not at a level which would allow competition to be possible. Again, the cellular mobile network although cheaper to install and activate, is operating at way below the minimum efficient scale for even modern technology.

5.4 The Myth of Free VoIP Calls

A fixed network infrastructure must be in place (and paid for) before the VoIP is "free". Customers need to be sophisticated with computers and data modems, and reliable power supply needs to be in place. Even using wireless broadband access (which is of lower cost), the basic fixed backbone network needs to exist and someone has to pay the monthly rental and Internet package fee in order for the customer to have VoIP access available.

5.5 Monopoly Bypass

Norfolk Telecom has taken the pro-active step to introduce Internet services, and more recently ADSL access services as well as Dial-up services. As higher speed Internet access is offered, it has been seen that there is automatic International voice call by-pass because of use of VoIP by SME and more sophisticated (and wealthy) consumers. Introduction of new services automatically triggers some infrastructure competitive by-pass. Thus service competition within the service offerings provided by the incumbent already exists and Norfolk Telecom accept this as a by-product of continued investment and introduction of modern services. Likewise, substitution of e-mails for long-distance voice calls is another form of competitive by-pass which exists within the incumbent's service offering

5.6 Backbone vs Last Mile

Someone has to provide the “last-mile” access. Norfolk Telecom do this by cross-subsidizing the access from the overall call revenues including from National, International and Mobile calls. It needs the backbone economies to help with high “last-mile” initial investment and ongoing operational costs. If competition occurs into parallel backbone network then access charges (retail and interconnect) will need to rise to make the “last-mile” investment and continued operation financially viable.

5.7 Conclusions

If a competitor was allowed to operate in Norfolk then:

- 1) They would not be interested in a ‘retail’ competition model as discussed above. The small size and already saturated distribution model suggests that there would be no incentive for competitive entry.
- 2) They would also not be interested in a ‘wholesale’ model. The fixed costs in creating such a solution would be prohibitive.
- 3) The infrastructure model does have some commercial appeal mainly due to the ability to provide lower quality services at a price that Norfolk Telecom cannot meet due to requirements on it to provide a reliable national service.
- 4) International call rates are an area that competition would focus on due to its very low entrance cost and high margins.

6 Analysis of the market

The purpose of this section is to examine some of the key telecommunication indicators and compare these between markets similar to that of Norfolk Island. From this it is hoped that some understanding of how services and/or pricing is relative to that offered by Norfolk Telecom as a monopoly provider.

6.1 Comparing markets

Norfolk Island is generally a difficult market to compare with other markets:

Population Size – at 2,000 people Norfolk is one of the smallest communities in the world. Telecommunications is a very scale related activity where there is a very non linear relationship between number of subscribers and implementation costs. For example the infrastructure cost of providing a mobile service in Australia for a carrier with 500k subscribers is in the order of \$80 USD per line. For an operator in the pacific with 10k subs it is in the order of \$250 per line²².

Affluence – While Norfolk only has approximate GDP figures, it is clearly a first world economy with a standard of living similar to that of mainland Australia.

Connectivity – As discussed throughout this document from a telecommunications perspective the fact that Norfolk only has international connectivity via satellite has a fundamental impact on all pricing models. If Norfolk had unlimited and costless access to international connectivity (which is essentially the case for most countries) then the whole pricing and service offer regime would be different.

Geographic Size – At 34square km it is one of the smallest economies in the world.

Political Environment – As an Australian External Territory with an independent telecommunications regime it does not have the benefit of making use of USO arrangements

²² This is based on data from a regional telecoms operator.

(like for example Lord Howe Island) with cross subsidisation from larger markets (Australian Mainland).

These result in an almost unique market situation so only relative market comparative analysis can be made. There is no market that is really similar to that of Norfolk, the closest in the Pacific being perhaps the Cook Islands – and even that has almost 10 times the population and a significantly larger land area.

The table below gives a general indication of the markets that will be used to compare with Norfolk Island. Note that while mainland Australia is clearly quite different to Norfolk it gives a good reference to what is the outcome in a highly competitive market.

| Economy | Population | GDP (per head) AUD **1 | Competition model |
|-----------------|------------|---------------------------|-------------------------------|
| Cook Island | 20k | \$6800 | GoE, no competition |
| Niue | 1600 | \$4000 | GoE, no competition. **2 |
| Tuvalu | 11k | \$1700 | GoE, no competition |
| Australia | 22,000k | \$32k | Fully competitive market |
| Wallis & Fatuna | 15k | \$4200 | GoE, no competition |
| Nauru | 11k | \$22k | External Monopoly |
| Norfolk Island | 2200 | \$25k [est] | GoE with no legal competition |

Notes on above:

- 1) Based on data from abc.net.au. Some of the data appears questionable but it is only considered from a general social perspective.
- 2) Niue has a complex model with a 2nd provider offering ‘free’ Internet access via virtue of the 2nd provider owning the very popular ‘.nu’ domain name.

What is interesting to note is that none of the above markets (with the obvious exception of Australia) have allowed telecommunications competition. While larger pacific markets (Solomon Islands, PNG, Fiji, Samoa, etc) have all introduced competition over the last 3-5 years none of the smaller markets have. This trend is consistent with the basic economic analysis of this report that indicates that these markets are simply not large enough to support external formal competition.

In 2008-2009, Nauru did have a competition review (funded by the ITU and AusAid and written by the same authors as this report) where the report findings and recommendation was that the market was not large enough to support competition and that a new Government owned monopoly operator should be formed. The subsequent Government decision was to invite a monopoly external provider (Digicel) to provide complete telecommunication services.

6.2 Relative penetration

One indicator of the effectiveness of an operator to provide effective services is a measure of penetration into the market of these services.

The table below gives some indicators as to the most common services.

| Economy | % of DSL subs | % of mobile subs | % of PSTN |
|---------------|----------------------|------------------|-----------|
| Norfolk | 82% households | 83% | 139% |
| Cook Islands | 25% | 27% | 85% |
| Niue | 0%**1 | 0% | 40% |
| Tuvalu | 10% | 5% | 11% |
| Nauru | 10% **3 | 40% | 15% |
| Aust Mainland | 75% of households**3 | +100% | 100% |

Notes on the above table:

- 1) Data is from the ITU. Some of the data is not up to date so should only be considered indicative and not absolute.
- 2) Niue has no DSL services currently (being rolled out Dec '10) but does have WiFi access.
- 3) This includes other similar technologies (Satellite, cable, etc).

While not a perfect indicator, the trend for Norfolk Island clearly shows that it has a level of service not seen in other 'similar' island nations. Norfolk has a service penetration similar to that of other first world countries (the majority of which have strong competition).

The penetration of mobile usage is lower than what would be considered first world standards but there are likely to be other social issues behind this. Norfolk Island previously had in 2002 a failed referendum where it publicly decided not to implement a mobile network. Given this legacy, there are likely to be a large percentage of the population (perhaps the 17% delta) who for philosophical reasons (rather than market failure) don't have mobile phones.

The lack of a formal competition framework can therefore be seen to not adversely affect Norfolk Island, having a (based on common service indicators) a high service level.

6.3 Comparison of various services pricing

Another indicator of relative efficiency and competitiveness is to consider the pricing of various telecommunication services and to compare with that offered in other markets.

The two comparative markets chosen should be discussed also as they highlight some important points. Nauru has a privately owned monopoly now in place (Digicel) which offers all telecommunication services. At it is a regional operator, it also has almost no infrastructure on the island except the base stations and satellite ground stations (the core network is in Fiji). It thus should represent what is the cheapest possible technical price of implementation.

In any international call pricing analysis it is critical to only compare markets that have a small population (as network infrastructure does not scale down in a linear fashion) and have only satellite connectivity for international interconnect as these are very important factors to consider.

Table – Pricing of voice services

| Call type | Norfolk | Nauru | Cook Islands |
|--------------------|---------------------|--------|---------------|
| Mobile – PSTN | \$0.20 to \$0.40**1 | \$0.30 | \$0.35-0.80 |
| Mobile – Mobile | \$0.20 to \$0.40 | \$0.30 | \$0.35-\$0.80 |
| Mobile – Australia | \$0.40 **2 | \$0.70 | \$0.97 |
| Mobile – NZ | \$0.60 **2 | \$0.70 | \$0.82 |

Notes on the above table:

- 1) Depends on time of day
- 2) For peak. Off peak is less
- 3) The Cook Islands data has been converted to AUD.

Based on the rather simple comparative data, the current pricing offered by Norfolk Telecom is at least equal to or better than other similar sized pacific markets. Of special note is that if a competitor such as Digicel entered Norfolk, the price of calls would be unlikely to go down.

Following on from the previous analysis of voice services, the other key service being provided by modern telecommunication systems is Internet data.

It is difficult to perfectly compare data services between operators but the following table gives a general analysis.

Table – Pricing of Internet Data services

| Service | Norfolk | Solomon Telecom **2 | Cook Island **1 | Australia dodo **4 |
|--------------------------------|---|-----------------------|--|--------------------|
| ADSL, 3GB download 1024/768 | \$90 per month, additional data \$0.06 per Mb | \$139 per month**3 | \$92 per month , additional data \$0.15 per Mb | \$50 |
| ADSL install | \$50 | \$191 | \$59 | \$99 |

Notes on the above table:

- 1) Data converted into AUD, from the Cook Island Telecom website <http://www.oyster.net.ck/>
- 2) Based on data from www.telekom.com.sb
- 3) Is for a 128/64 k service with 1 GB download limit.
- 4) It is difficult to compare plans absolutely as none are completely identical. Pricing is from www.dodo.com.au

What this data does show is that the pricing is similar to or better than other comparable markets. Clearly pricing is more expensive than for that of Australia but technically there are several reasons for this:

- 1) All international traffic (which includes 99% of all internet traffic) has to go via satellite. Satellite bandwidth is 100-1000 times more expensive per byte to deliver than optical transmission systems (which is what is used by large countries such as Australia).
- 2) Norfolk Telecom uses a 9.6 Metre C band satellite dish for international communications. This is a high quality solution that gives high reliability and quality to

the Island. This comes at a premium price, the costs of which have to be amortised over the international traffic (voice and data).

6.4 Market Gap analysis

The market of Norfolk Island is almost unique as it has a first world economy (a per capita GDP similar to that of large 1st world nations) but with a very small population, very isolated from other markets and infrastructure.

General analysis (for example the Tables in the previous section) indicate that Norfolk when compared to other Pacific Markets has very competitive price and quality offerings. When compared to mainland Australia however there are some limitations.

Services associated with International connectivity (International calls & the Internet) are higher than the Mainland. This is consistent with the high cost of satellite bandwidth which is directly related to the volume of traffic generated. While submarine cable is viable for larger markets, it is not economically viable for markets the size of Norfolk²³. There is currently no economic or technical way for Norfolk to get cheaper international connectivity.

When comparing the various service offerings of Norfolk Telecom to that of (say) Telstra Australia (an operator that exists in a highly competitive market):

PSTN offering: The Ericsson AXE platform used by Norfolk is identical to that of Telstra in Australia. It is noted that Norfolk Telecom has plans to upgrade their existing network to a NGN platform in the future

DSL services: The current ADSL offering is technical similar to that offered by Telstra and the other main Australian carriers. While the speeds and download limits are less, this cannot be fundamentally improved as detailed previously above due to international backhaul limitations.

Mobile: The GSM mobile network currently provided by Norfolk, while not 3G/UMTS, represents a reasonable level of functionality. It provides prepaid and post paid service along with International roaming. While the absence of a 3G network (which enables wireless data services) is certainly a negative it should be noted that the only Pacific Nation outside of Australia and New Zealand with a 3G network is Vodafone Fiji with a population base of approximately 1 million people. It is our understanding that Norfolk Telecom plans to evaluate a 3G network for possible launch in 2011.

6.5 Conclusions on Norfolk Telecom service offering

When compared to common telecommunication service metrics, the standard of service delivered by Norfolk Telecom is comparable to that of other first world economies, noting that Norfolk Island also has some fundamental technical issues associated with isolation.

Given that much of the Norfolk Island population spend time also in Australia and New Zealand they are obviously well able to directly compare pricing and service offering and question why such a pricing level is not offered on Norfolk. Without question Norfolk Telecom pricing for the provision of international connectivity is higher than for that of Australia and other nations with Fibre connectivity but it is more than reasonably priced when compared to countries with similar restriction to using satellite.

²³ See Australian DFAT report "Report to Australian Government on satellite services in the Pacific"

7 If competition was introduced what would it most likely look like

The macro economic analysis from previous sections indicates that there are few if any financial advantages to the people of Norfolk Island as a whole in implementing competition. The analysis also suggests that there are few if any advantages from a service delivery perspective in implementing competition. Competition usually occurs when the incumbent is inefficient (in Norfolk Island this is not the case), where retail prices are excessive (they do not appear to be so when compared to other Pacific island nations), where prices for long distance calls/traffic are high and costs allow emergence of more efficient and lower cost transmission (there is no long-distance traffic except for international traffic), where retail costs are inefficient and/or the numbers of subscribers and traffic volumes are high enough to allow the emergence of retail service provision where the new retailer has lower costs than the existing incumbent (unlikely as the size of the market does not come close to the minimum efficient scale).

Competition which exists because the incumbent is required by law or practice to cross subsidise the new entrant, is economically inefficient, and in a small market such as Norfolk Island will only increase the overall cost base of the Island's information and communications technology (ICT) service delivery. This is nothing more than an arbitrage play, which allows the new entrant to take profits from the cross subsidy required to allow competition to occur. The cross subsidy of the provision of the existing infrastructure at below cost and the provision of services which are of less quality and reliability, provides the margin on which the new entrant exists. Such strategy has been shown in other much larger markets, not to be financially sustainable in the long-term. Financial collapse of the inefficient new entrant usually occurs within two to three years, and their losses are high because what little infrastructure they deploy (usually billing systems and call / data usage capture equipment, has a six to ten year life.

Regardless of advice, the administration may wish to introduce competition to the Island, in which case possible implementation scenarios will be now discussed. There is extensive discussion in section 5 of this document the various theoretical options. In this section only the more plausible options will be considered.

7.1 Technical & economic background on competition models specific to Norfolk Island.

It is again important to highlight some of the fundamental considerations that make a competition analysis of Norfolk Island especially interesting.

Key issues are:

Satellite being the only form of connectivity on/off island. This is a highly scale related technology. To introduce different operators to have their own satellite services does not make economic or technical sense for Norfolk. All satellite services should be provided by the one operator (and then charged to other operators requiring the service on a cost plus basis) in order to maximise efficiencies for the total Island.

The need to offer a reliable service. Norfolk Island is an isolated community. It needs to be able to offer carrier grade communications to the public. In order to provide this high level of reliability a significantly higher level of CAPEX needs to

be invested compared with deployment of a commercial or domestic grade of service. This problem has been seen with recent ‘competition [noting that there are strong concerns that this is likely illegal]’ providing a domestic grade service (thus offering a more price competitive solution to the market) on the basis that Norfolk Telecom is providing cross subsidisation, and is available should the less reliable service be interrupted by rain or technical failure. It is a technical fact that the service provided by a Ku band satellite transmission service is inferior to that available from a C band satellite transmission.

Integrity of International numbering plan. Norfolk Island administers the +6723 number series. As is the case around the world with small nations, it easily occurs that the numbering plan is ‘black holed’ from being accessed from other countries (the inwards call does not even receive a progress tone). This has happened to Norfolk several times when various attempts (some legal and some illegal) have been made to ‘divide’ the numbering plan into smaller, discreetly routable components. Based on the authors extensive experience in small Pacific Markets it is strongly advised not to divide the numbering plan beyond +6723. The only disadvantage of such an approach is that it prevents 2nd operators (who want their own separate numbering plan) to operate international traffic directly.

7.2 Possible models

The below scenarios describe the various competitive service models that are plausible to implement in the Norfolk Island situation.

Scenario 1 – New mobile operator

Discussion: Often, when a market is introducing competition it is initially done via the issuing of a second mobile operator licence (local examples include Australia, PNG, Solomon Islands, etc). Such licences are issued in order to improve the level of service (more features, additional coverage, etc) or improve pricing. If such a licence was issued in Norfolk it is likely that two types of market entrants would be interested:

- 1) **A regional operator such as Digicel.** Based on all the other markets that Digicel has entered, it would only be interested if it were given an exclusive new entrant license. In other markets they have rolled out network coverage further and faster than the incumbent and used blitz marketing to overwhelm the competition and obtain a dominant market situation. This opportunity does not exist as Norfolk Telecom already has full population and geographic coverage.
- 2) **A ‘Tier3-4’ operator.** This would be an operator who would provide a technically poor (ie: not carrier grade) solution and attempt to differentiate on price, admitting their service is of lower quality and reliability. There are several of these in the region (Pacific Teleports - PacTel being such an example).

Analysis: There is no indication that the mobile service currently being overed by NT is substandard in any way. They provide a technically competitive and cost effective solution to the public. Replacing the existing mobile operator (NT) where profits are directly passed to the government is clearly more logical than having a new operator, cherry picking high volume customers, where profits go to an external party. The diversion of profits to the pocket of a few rather than to the benefit of the overall community cannot be underestimated. The diversion of such funds to an off-shore supplier would be tragic.

Conclusion: To introduce mobile competition would be illogical. Due to the small market size, it cannot service two operators. If a credible new mobile operator entered the market it is likely they would request exclusive access and thus NT would have to be removed from offering their services. Any benefit to the Norfolk Island community does not seem to exist.

Scenario 2 – New wireless [WiFi or WiMax] ISP provider, with own international connectivity

Discussion: This is an option that has been operating (it appears in direct violation with the Telecoms Act however and thus appears illegal as discussed above) for some time (4+ years) in Norfolk.

Analysis: Based on the current setup, this model relies on the Norfolk Island Administration (via Norfolk Telecom) indirectly subsidising the operations of the competitor. This occurs because currently Norfolk Telecoms provides a full service, high reliability voice and data services to the total community which has redundancy features whereas the ‘competitor’ does not. Access to network infrastructure is forced through political and community pressure at prices which are below financially sustainable cost. It appears to be an arbitrage play providing lower quality service as discussed above. The services offered for voice substitution are based on VoIP technology which can provide good quality when the underlying carriage services are carrier grade, but which quickly become patchy when the carriage service is of less quality (eg: Ku Band satellite). For this option to work going forward (apart from obviously requiring changes to the legislation to allow this activity to become legal), an annual licence fee would need to be introduced on the incoming provider to offset the loss of effective tax revenue currently received via Norfolk Island dividends, and for the subsidisation being provided by Norfolk Telecom from the loss of revenues and customers through the ‘cherry picking’ competitive process (there will be a loss of scale and scope due to the diversion of retail income and call / data volumes).

Conclusion: To legalise this model, the new entrant would have to pay an annual licence fee (calculated in section 9) to offset the current inequality to the Norfolk community. The entrant would then be free to offer wireless (WiFi, WiMax) services to the public.

Scenario 3 – New wireless ISP provider, using Norfolk Telecom international connectivity

Discussion: This scenario is a variation of the previous scenario where the difficulty of cross subsidisation by the Norfolk Island Administration is reduced (access to the copper network is still required) and the lower quality and reliability from the bypass satellite link is removed as the international connectivity is provided by NT. The costs of establishing IP connectivity would likely be borne by Norfolk Telecom (usually the new entrant pays for most of the incremental cost to achieve interconnection).

Analysis: NT would provide wholesale IP connectivity to the provider, albeit at a carrier grade of service. Access to the copper network maintained by Norfolk Telecom would also be required. Much of the situation in Scenario 2 remains of concern and would apply in this scenario as well. The pricing provided by NT is

important to calculate such that the true cost of NT providing the service is calculated (this is done in section 9)

Conclusion: This model would be reasonably simple to implement. It still reduces the overall telecommunications efficiency of Norfolk Island but if the Norfolk Island Administration is determined or coerced to allow competition then this would be a logical compromise in minimising damage to the Norfolk community, through reducing the economic and operational efficiency of Norfolk Telecom, and through diversion of profits to a small group of island residents, rather than having this available to the community as a whole through the dividend stream to the Norfolk Island Administration.

Scenario 4 – DSL & PSTN provider, using providers own international connectivity

Discussion: This scenario appears to be what a potential provider wishes to do almost immediately in Norfolk. In this case Norfolk Telecom would provide:

- Access to the existing Norfolk copper that goes to customer premises allowing customer access services;
- Access to the existing Norfolk copper between the Norfolk Exchange and the competitor's premises for data transmission services; and
- Space in the Norfolk Exchange for their own equipment (including access to uninterruptible power supply, secure facilities and air-conditioning).

Analysis: This model has a number of fundamental technical and commercial issues. Allowing a second provider access to a block of +6723 number range places a huge technical risk on the Norfolk numbering plan such risk needs to be avoided.

The cross subsidisation issue associated with a provider providing their own international gateway could be reduced via either licensing fees or the mandating of a certain network performance quality / reliability. Much of the remaining situation in Scenario 2 remains of concern and would apply in this scenario as well.

Conclusion: This model should not be allowed for technical reasons. It is the model no doubt most preferred by a new service provider as it offers the best ability to 'cherry pick', assuming that they can get the licence fee removed through community or political pressure.

Scenario 5 – DSL & PSTN provider using Norfolk Telecom connectivity.

Discussion: A variation on the previous scenario where Norfolk Telecom would provide:

- Access to the existing Norfolk copper that goes to customer premises allowing customer access services;
- Access to the existing Norfolk copper between the Norfolk Exchange and the competitor's premises for data transmission services; and
- Space in the Norfolk Exchange for their own equipment (including access to uninterruptible power supply, secure facilities and air-conditioning);

- A wholesale network feed to the Internet via the NT international gateway; and.
- A wholesale PSTN connection to NT, where NT remains as the international gateway.

Analysis: Of all the scenarios presented, this and scenario 3 are the most logical and minimise the damage that competition would bring to the Island. This is also the easiest to implement and minimise disagreement associated with provider access charges. The access charges can be fairly and transparently calculated. However, it is also the most costly as carrier grade IP connectivity (for data) and switch circuit interconnection (for voice), would be required. The investment by the new entrant and the need for licence fees

Conclusion: This model could be considered for implementation so long as the charges are actually levied on the entrant.

Scenario 6 – DSL provider using providers own international connectivity.

Discussion: A variation on the previous scenario where Norfolk Telecom would provide:

- Access to the existing Norfolk copper that goes to customer premises allowing customer access services;
- Access to the existing Norfolk copper between the Norfolk Exchange and the competitor's premises for data transmission services; and
- Space in the Norfolk Exchange for their own equipment (including access to uninterruptible power supply, secure facilities and air-conditioning).

The provider would have their own satellite dish with international connection to the Internet.

Analysis: This is similar to Scenario 2 except with a different access medium (existing copper in ground). Based on the current setup proposed today [It is our understanding that one potential provider wishes to provide this service immediately, however, providing services which also appear to be in violation of the Act], this model relies on the Norfolk Island Administration (via loss of revenues from Norfolk Telecom) subsidising the operations of the competitor. This occurs because currently Norfolk Telecoms provides a full service, high reliability service to the total community whereas the 'competitor' does not. For this option to work going forward (apart from changing the legislation to allow this activity to become legal), an annual licence fee would need to be introduced on the provider to offset the subsidisation being provided by Norfolk Telecom and the Administration. Fees would also be charged to access to copper lines and access to the exchange site.

Conclusion: To introduce this model, the new entrant would have to pay an annual licence fee (calculated in section 9) to offset the current inequality to the Norfolk community.

8 Likely impacts of competition

The introduction of formal competition into Norfolk Island will have profound effects on the island community. The following paragraphs explore these likely outcomes.

8.1 To Norfolk Telecom

The exact impact of competition on NT is difficult to judge at this point as it would be partially determined by how competition is implemented, and how successful the new entrant is in 'cherry picking' high value customers away from NT. Likely impacts are that:

- 1) The profit of Norfolk Telecom will fall faster than the loss of customers, because of the high proportion of fixed costs in a telecommunications business, operating in a micro market. This will have two direct impacts on the Norfolk community:
 - a. The reduction of dividends available from profits to the Administration; and
 - b. Norfolk Telecom being unable to upgrade existing infrastructure because it will become somewhat cash strapped as it loses market share, particularly from higher margin customers.
- 2) In the long term there will likely be a drop in service quality and the type of services available to the broader Norfolk Island community due to the lack of free cash flow to allow further network and service innovation and development.

8.2 To Norfolk community

The free cash flow arising from the activities of Norfolk Telecom, are returned to the Administration through the consolidated nature of the Administration's accounts. There is notionally a dividend paid to the consolidated revenue, and this free cash flow after budgeted and approved capital and operational expenditures is available to support the Norfolk community in other ways. This could be any of a number of things, including funding for road repairs, support of the radio broadcast service, support of the lighter service or any number of other community activities supplied by the Administration.

Because by their nature, new entrants are likely to be either local or offshore private entities, the Norfolk community needs to fully understand that the introduction of competition will lead to a loss of services provided by the Administration, which are very unlikely to be replaced by the commercial activities of the new entrants.

Because it is a micro market, separate from other export markets, the increase in telecommunications competition including potential reductions in prices will not likely increase the sector revenue base (the size of the 'pie' if you wish), to offset the revenues lost by the Administration and retained by the new entrants. The negative elasticity of demand will be constrained by the market size and community affordability issues. The lost notional dividend to the Administration will not be replaced by tax on profits of the new entrants, but is only able to be retained where licence fees are charged. Competitive neutrality can be maintained by charging NT the same fees, but overall the Administration will be worse off financially. This will very likely have a detrimental effect on the overall community.

Competition will benefit the very few and the expense of the many.

From a practical investment point of view, the community's ability to have NT invest in new technology will stall, and their level of overall service will go down:

- The need for investment in 3G services to replace aging copper will likely be delayed;
- The reliability of both PSTN and ADSL services will go down where the copper network cannot be maintained or replaced at the end of its service life; and

- In the long-term there will be a greater upfront hurdle to jump where the cost of new telecommunications technology needs to occur in one hit rather than incrementally over time.

9 Equal access pricing calculations

The following are our initial estimates of the access pricing that have been calculated using the currently available information. At present the analysis is hampered by the need for more detailed information, and the time to review and cross-check the analysis. The analysis is unlikely to be more accurate than +/- 15% of the values stated. Further work would need to be undertaken to prepare final recommendations to the Administration on access pricing. On the basis of these caveats, the suggested access services to provide the competitive scenarios in section 7.2 above are as follows:

- 1) Charge rate(s) of the new provider getting access to a piece of copper for DSL;
- 2) Charge rate(s) for new provider to get internet access via managed ADSL links from Norfolk Telecom;
- 3) Charge rate(s) for new provider to get international calls and interconnect to local PSTN;
- 4) Charge rate(s) for new provider to install equipment in NT's exchange room;
- 5) Charge rate(s) for international transmission provided by NT's satellite links; and
- 6) Licence fee(s) payable to NT or the Administration for the new provider having their own international IP connection. (This is to prevent cross-subsidisation as NT has to provide a high level service and the new provider potentially does not, and the Administration's income derived from the telecommunications sector needs to be maintained from the industry irrespective of competition)

The following table provides our initial estimate of the relevant access and interconnect charges and rates to allow the scenarios in section 7.2 to be implemented. Further work will be required to refine these numbers.

| Wholesale Pricing Table (Tentative) | | Interconnect Setup | Access Setup | Line Rental | Call / Interconnect Usage | Internet Usage | Licence Fee |
|-------------------------------------|---|--------------------|--------------|-------------|---------------------------|----------------|-----------------------------------|
| | | \$/Link/m | \$/Line | \$/m | \$/MoU | \$/MB | \$/ADSL Line/m or \$/MoU or \$/MB |
| 1 | Copper Customer Access Line (naked) | - | 50.00 | 27.35 | - | - | 1.57 |
| 2 | ADSL Customer Access Line (managed, 1Mbps) (1) | - | 50.00 | 34.78 | - | 0.07 | 1.57 |
| 3 | PSTN Interconnect (2 x 2MBbps links assumed) | 28,312 | - | - | 0.24 | - | 0.007 |
| 4 | Exchange Space, Power & Security | - | At cost | 340 | - | - | - |
| 5 | International IP Bypass Satellite Link (3) | 7,340 | - | - | - | 0.005 | 0.0007 |
| 6 | International IP Transmission by NT Satellite Link (3), (4) | 15,835 | - | - | - | 0.005 | 0.0007 |

- Note :
- 1) These are tentative numbers and further work is required to ensure accuracy and no cross-subsidy to the New Entrant
 - 2) Download allowance 1,000 MB per Line per Month
 - 3) 2 x 2Mbps interconnect links assumed between NT and New Entrant
 - 4) 2 x 2Mbps down and 1 x 0.5Mbps up satellite transmission

Please note the table assumes the new entrant is not required to pay for the access and interconnection set-up costs up front (as is usually the case), but rather NT undertakes this investment and the new entrant pays this back in its set-up fees over time. The analysis seeks to provide financial competitive neutrality, but this approach to recover these costs is already a notional cross-subsidy to the new entrant. In effect the funds are not available to NT to improve its own network and services delivery, but are used to allow the new entrant to access infrastructure which is already partly paid for by the Norfolk community. This structure may need to change following debate over the extent the Norfolk community want to cross-subsidise a new entrant.

10 Implementation guidelines for competition

If, regardless of the analysis made from this report that recommends the contrary, the Administration still wishes to introduce competition into the Norfolk Island telecommunications market then this section details some of the steps required to do so. Some 'budgetary estimates' are also included as an indication of the costs associated with these steps. Given the significant cost of implementing competition the Administration would have to carefully consider if the cost is worth the political gain (as this report shows there is no economic gain in implementing competition).

10.1 Implementation summary:

The following represents the basic summary of how the authors recommend the system to be implemented. In general terms it would be expected that the process might take 12-24 months to be implemented with a cost around \$700-\$1,000k AUD from the Administration. After this process a competitor(s) would be allowed to enter the market place.

- 1) The administration makes the general decision to introduce some form of competition into the market.
- 2) An external party is engaged to lead the government through the process. Both the ITU and World Bank both will be able to recommend external consultants to engage. [Potential cost to Norfolk \$200-\$250k AUD]
- 3) Agreement on the exact nature of the competition being allowed and model. This would be done in conjunction with the consultant's advice.
- 4) The Telecommunications Act will have to be amended or rewritten to allow competition. The Act would also be modernised to align with recent technology, systems, etc. [Potential cost to Norfolk \$250k-\$350k depending on legal team used]
- 5) A regulatory function would need to be setup, albeit it is suggested the primary approach would be on self-regulation and would rely on the integrity of Norfolk Telecom and the new entrant in acting fully within the law, and the community pressure and non-acceptance of a failure in cooperation between the parties. It would be logical for this function to be setup within an existing government office to minimise costs, and for regulatory scrutiny to be on an ad hoc basis. [Potential cost \$50k – \$100k per annum]
- 6) Process setup for the assessment and licensing of market entrants. [Potential cost \$50k – \$100k]
- 7) Confirmation of licence fees and access models from consultants. Initial calculations of these fees and costs are in this document.
- 8) A tendering process for new market entrants would be required to screen the technical, financial and administrative capability of new entrant(s) and to allow to commercial setup. [Potential cost \$150k – \$200k]
- 9) Ongoing monitoring from the regulator would then ensue that all parties comply with the legislation.

10.2 Key implementation points

- 1) Norfolk Telecom would have to be paid money from new market entrants for:
 - subsidy for NT to provide high reliability service (ie C Band satellite vs Ku Band satellite) if the entrant is not using the NT international infrastructure.
 - Management of number series (+6743), re-direction of incoming calls would have to occur at the NT exchange.

- Access to copper network if PSTN or DSL services require actions from NT.
 - Co-location fee where equipment is required to be located within NT exchange (for example DSLAM).
- 2) Incoming voice calls MUST to go via NT first to avoid major technical issues for Norfolk Island voice telecommunications services generally.
 - 3) Implementation of competition must be cost based and not be subsidised by the Administration and/or Norfolk Telecom. Currently competition is being subsidised by the Administration (through loss of dividends which is in effect a tax stream), and by Norfolk Telecom (by not charging for the full costs and opportunity costs which it incurs) which is why NIDs is making profit in a market that cannot economically sustain competition.
 - 4) Current competition seems to be acting contrary to the provisions of the current legislation. This cannot be allowed to continue. The Administration cannot be seen to endorse any person's disregard for the legal framework of a small island society.

11 Discussion around recent court case

NT has provided a copy of the judgement by Kiefel, J referred to as *Administration of Norfolk Island v Ryan [2007] NFSC 5*, and dated 12 June 2007. Strategic Economics is not qualified to and does not provide legal advice on the judgement.

However Strategic Economics and the authors of this report in particular are frequently required to read and interpret legislation and court judgements in order to undertake the work of designing, installing, testing and operating communications, telecommunications and broadcast networks. In particular they have experience under the Australian *Telecommunications Act 1997*, *Telecommunications Act 1992* and numerous associated Acts, as well as similar legislation in Papua New Guinea (based on the Australian *Telecommunications Act 1989* and *Telecommunications Act 1992*) and other jurisdictions throughout South East Asia.

Kiefel, J judgment is interesting in its effect when the reasons for the judgment clearly states that *"There was no dispute concerning the operation of the equipment which allows the provision of the internet services from the defendant's premises."*²⁴ Further the reasons for the judgment also clearly state *"There can be no doubt that the service undertaken at the defendant's premises is a telecommunications service. The plaintiff is correct in its submission that it involves guided and unguided electromagnetic energy and does not involve solely radiocommunication."*²⁵ But then the judgment expressed is extremely narrow with the effect that the defendant's satellite dish cannot be turned off as it is providing radiocommunications services which may include broadcast services such as Pay-TV, Subscription-TV, Free-to-Air TV and re-broadcast of the same services, but has not been proved to provide telecommunications services. The judgment does not arrive at a conclusion that the defendant is in breach of the *Telecommunications Act 1992* of Norfolk Island (the "Act"), in its provision of telecommunications services.

The Act defines the reserved rights of NT in s.5(a) and particularly s.5(a)(vi), s.6, s.6A(1), s.6B(1) and s.7, and other less relevant sections. All of these sections should be reviewed in

²⁴ Kiefel, J, paragraph 12.

²⁵ Kiefel, J, paragraph 17.

relation to the provision of internet services, or indeed other telecommunications services which NIDS and/or the defendant may be considering supplying.

The practical view of internet services is that they are an amalgam of access services, switching services (even if packet switched), transmission services, and interconnection services, all of which are known as telecommunications services, combined with computer servers and software which provide the applications services and contents services needed for e-mail and web searches. These latter services in most jurisdictions are not considered to be telecommunications services, and are usually fully open to competition.

The internet services provided by the defendant can only interact with the world wide web through an international transmission link (providing transmission services) which has a point of interconnection at its mainland termination site (providing interconnect services). The internet services can only be accessed by NI customers by links which provide access services. The satellite dish and its related electronic components appear to have the nature of a *“facility ancillary to a reserved line link”* and therefore are a matter which should be considered under s.7 of the Act. This is a point of potential breach.

The defendant appears to have been judged by Kiefel, J to be providing *“telecommunications services to and from Norfolk Island”* which may be an issue under s.5(a)(vi), for the reason that internet services are telecommunications services and cannot be provided without an international transmission link which is clearly not being provided by NT. This is a further point of potential breach.

Irrespective of the existence of a satellite dish and whether it is argued to only provide radiocommunications services, the defendant has been shown to also be providing telecommunications services through *“a satellite dish that has been configured for the purpose of transmitting or receiving any telecommunication (other than for the reception of television from a pay-tv provider or free-to-air-tv provider)”*, and therefore this is a matter which should be considered under s.6B(1) of the Act. This is a further point of potential breach.

The defendant is judged to be providing internet services to the public, and therefore telecommunications services to the public, and specifically *“that it involves guided and unguided electromagnetic energy”* which appears to have the characteristics of a reserved line link, and therefore is a matter which should be judged under s.6 of the Act. This is a further point of potential breach.

NIDS current requests to NT to allow it to install DSLAM and ADSL infrastructure directly to reserved line links, can only be for the purpose of the provision of internet services (which are telecommunications services), or other telecommunications services such as VoIP, broadband data or teleconferencing services, to end-users within NI. S.6A(1) of the Act specifically says anyone other than NT *“must not ... install a line link if it is intended that that line link should be connected to a reserved line link, or if a line link has been so connected ... must upon being so directed in writing ... disconnect any such line link”*, and yet this is likely to be the outcome of the NIDS request. The legality of this request is a matter which should be considered under both s.6A(1) and s.7 of the Act. This is a further point of potential breach.

The current requests by NIDS to NT to install DSLAM and ADSL infrastructure suggests NIDS interprets the judgement by Kiefel, J to allow it to access NT infrastructure for the purposes of providing telecommunications services to the public. It is far from clear that the intent of Act is to allow such a detailed and intrusive degree of competition within the NI telecommunications sector. Such services appear to be reserved services under the Act. This is a further point of potential breach.

Irrespective of the use of the satellite for broadcasting services and the apparent open competition in these services, and given the nature of the internet services, the defendant

should review whether it is in breach of other sections of the Act by its current behavior which were not directly judged by Kiefel, J. The Norfolk Island Administration should also review in further detail what activity in relation to the acceptance of, or the introduction of, competition into telecommunications services, it is empowered to accept, or implement, under the Act. It should not condone behavior which is not supported by the law.

12 Recommendations to the Administration

Key messages for the Norfolk Island Administration are that:

- 1) It is recommended the Administration seek new legal opinion from experts in telecommunications law as it applies on the Australian mainland and in relation to the local NI law, on the recent court decision as it appears from a non-legal interpretation of that decision that NIDs is not acting within the framework of the *Norfolk Telecommunications Act 1992*.
- 2) It is recommended the Administration await the outcome of new legal opinion and pending advice on the issues raised in the above report; stop any expansion of additional services that NIDs is requesting. The Administration cannot afford to be seen to endorse behaviour which is later found to be in contravention of the *Telecommunications Act 1992*.
- 3) The introduction of competition to the areas of Internet service provision, International calls or mobile calls would have a negative impact to the people of Norfolk Island both in terms of revenue available to the Administration (a dividend or notional tax stream) and the long term reduction in service offering and quality, not just in the telecommunications space, but also in other services funded from the dividend stream of Norfolk Telecom.
- 4) If a strategic decision is nevertheless made by the Administration to introduce competition then a further expansion to this report needs to be made to:
 - a. Provide a further detailed financial analysis to develop a more accurate cost of allowing a competitor access to Norfolk Telecom assets;
 - b. Determine the cost of carrier licenses;
 - c. Recommend the detail on the type of competition which would be supported and the technical details of how this would be implemented; and
 - d. Prepare a detailed implementation plan for the introduction of competition.

In addition the Administration would need to undertake the following steps:

- a. Obtain legal advice on the amendments to the legislation which would support the introduction of competition, and would define the limits of the competitive service offering;
- b. Following amendment of the *Telecommunications Act 1992*, have such new legislation pass through the parliamentary process; and
- c. Provide directions to Norfolk Telecom to implement the new law in relation to the introduction of competition.

13 About the Authors

This document was written by the following two people:

Simon Lardner



CEO, Challenge Networks

- Simon Lardner is CEO and co-founder of Challenge Networks, a Telecommunications System Integrator specializing in design, build and management of carrier networks around the world.
- Simon was previously Global Support manager for the Telecommunications company Ericsson.
- Simon provides advice to various Governments associated with Telecommunications strategy.
- He also has ongoing consulting work with the Australian Telecommunications Regulator ACMA.

Biography

With over twenty years of international experience in the Telecommunications industry, Simon has strong knowledge of many of the technical, regulatory and commercial aspects driving telecoms.

With an avid interest in technology, Simon commenced his technical career at 16 where he co wrote and sold commercially his first computer program for the then newly released Apple computer platform.

After graduating from University he joined the telecommunications vendor Ericsson where for the next five years he worked on the design of the AMPS (and latter GSM) mobile phone systems, developing several technology patents on behalf of the company. He latter moved into mobile network design and deployment where he worked for the next six years as finally the overall technical responsible for rolling out more than twenty mobile networks in fifteen countries. He latter moved into Ericsson's Global management team, spending several years based in Sweden, USA and Canada. In his last role in Ericsson he part designed and project managed the implementation of Ericsson's follow-the-sun Global support structure, an organisation of more than 2500 Engineers.

Simon has ongoing roles with several Government and semi Government organisations, providing ongoing assistance in the areas of strategy, Cyber Security and technology. He has represented the Australian Government at several international for a and continues to provide advise to the Australian Regulator ACMA.

Now with Challenge Networks and based in Melbourne, Simon spends much of his time travelling developing opportunities with Telecommunications, especially in the Asia Pacific region.

Simon has a first class Honours degree in Computer Engineering from RMIT and a MBA from Melbourne Business School. He is married with three children and two boats.

David Dawson

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- David Dawson is Principal Consultant and co-founder of Strategic Economics Consulting Group, a boutique consulting firm specializing in regulatory economics, business planning & strategy, and industry, economic and financial analysis around the South East Asian and Pacific regions.
- David has worked as a consultant for over 13 years including a period with PricewaterhouseCoopers, and prior to that was the Economics Advisor to AUSTEL the Australian telecommunications regulator through to mid 1997.
- David currently has a part-time role as the Associate Commissioner (Non-Resident) to the Independent Consumer and Competition Commission (ICCC) of Papua New Guinea, a statutory appointment with a five year term.



Biography

David has been consulting in the fields of regulatory economics, utility wholesale and retail pricing, incentive based regulatory frameworks, and business regulatory strategy for the last 13 years. His experience has extended across a range of industries and countries. It has included assignments in the telecommunications, electricity, gas, water and other utility sectors.

David has considerable experience in retail and wholesale competitive strategy for regulated utility businesses. He has extensive experience in financial and regulatory modelling, and modelling of price and revenue paths, opex and capex forecasting, demand forecasting, retail and wholesale tariff analysis and business & asset valuations. Modelling includes third-party access pricing to TSLRIC+, LRAIC, SRMC and other costing standards typically used in network utility businesses. Also provides advice on weighted average cost of capital, business plan development and business strategy.

Within the telecommunications market David has advised a number of clients on various issues including:

- Arbitration of fixed, mobile and international termination rates in PNG
- Review and development of avoidable cost pricing models of Telstra retail and wholesale businesses
- The valuation of Telstra's fixed, mobile, HFC and other assets for purposes of Historical Cost Accounting and Current Cost Accounting regulatory reporting
- A review of Telstra interconnect models for fixed network services
- Development and subsequent review & update of the Telikom (PNG) Limited regulatory contract for the ICCC, which included setting of the retail price control and service delivery standards

David has an Honours degree in Mechanical Engineering from the University of Melbourne and a MBA from Melbourne Business School. He is married with four children.