



**Papua New Guinea
Telecommunications Deregulation Blueprint**

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Papua New Guinea Telecommunications Deregulation-Blueprint

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1. INTRODUCTION

1.1. General

This document provides a blueprint for the deregulation of the Papua New Guinea telecommunications market.

1.2. Scope

This document provides detail on the structure, regulation and landscape for the deregulated PNG telecommunications market. It should be used as a basis for effecting the various changes to policy, regulation and company structure to facilitate the implementation of the deregulation.

1.3. References

Global Information Infrastructure Model, GSC Melbourne 1994

2. CURRENT PNG TELECOMMUNICATIONS LANDSCAPE

Telecommunications in PNG has been suffering from effective mismanagement of the government owned incumbent telecommunications carrier, Telikom PNG (Telikom). Numerous attempts to improve this situation through privatisation, changes in management and introduction of facilities based competition have not resulted in any advancement or improvement in the situation. These various failed attempts however, place PNG in a very unique and advantageous situation to implement an advanced deregulation structure that retains significant asset value to the current government shareholder, whilst providing effective and true competition for services to the end customers.

PNG has some of the most rugged and remote locations in the world. Delivering reliable, effective telecommunications services to such challenging locations is something that requires significant investment and a focused approach to ensure the benefits are made available to as much of the population as possible. Deregulating the telecommunications market is to provide benefits to customers through competition. These benefits include better service, lower prices and service innovation as the providers compete for the customer revenue.

The basic telecommunications infrastructure has suffered from a lack of investment for at least the past 10 years, and is not in a position to provide wholesale services and interconnection to other facilities based carriers. The current infrastructure is under-dimensioned and in many places, obsolete, resulting in poor service quality and performance. A significant investment is required to rehabilitate this government owned network to support competition and allow Telikom to retain and grow its customer base.

Telikom is currently in a very precarious situation in having to spend significant capital to refurbish its network whilst rapidly improving its quality of service to defend its market share against two new mobile competitors who have been awarded licenses in March 2007. One likely outcome of this defence will be the redirection of capital onto market share protection away from the much needed upgrade of regional and rural facilities, resulting in continued degradation of services outside the 229 required locations the competitors are required to operate in. The introduction of facilities based competition will also lessen and likely remove the possibility of obtaining external funding for the much needed network refurbishment, requiring all capital projects to be funded through operational profit (which could be significantly less in a competitive environment). This approach to deregulation is likely to have a catastrophic financial effect on Telikom, significantly impede any advancement of health and educational services, and result in an overall degrading of services outside of the regulated locations for competition.

There are also four ISPs operating under Value Added Services licenses, and provide Internet services to customers using wholesale Internet transit services from Telikom and their own dialup and wireless infrastructure for end customer connection.

3. GLOBAL INFORMATION INFRASTRUCTURE MODEL

In the early 1990's, all of the major standards bodies and fora formed the Global Standards Collaboration (GSC) to satisfy three goals: produce consistent handling of intellectual property amongst the standards bodies; converge and ratify processes for electronic document storage and interchange of standards documentation; and produce a high level network architecture model that could be applied around the world as various markets were deregulated. This model was referred to as the Global Information Infrastructure (GII) model, and provided an effective framework to model any telecommunications network (regardless of technology) and allow standards and regulatory bodies to produce specifications for various interconnection boundaries.

The basis of this model divided the network into four areas: customer premise, access, core and application. This model is shown in Figure 3-1.

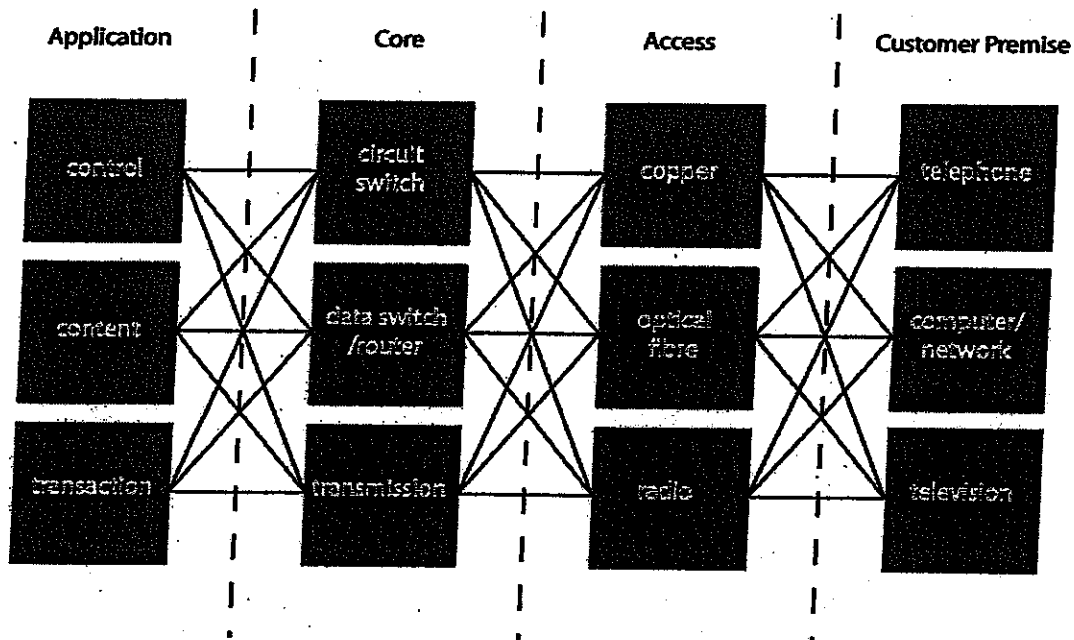


Figure 3-1 - Global Information Infrastructure (GII) Model

The customer premise refers to the customer's equipment beyond the network boundary. In the case of fixed line services, this includes any customer owned equipment such as telephone handsets or network/computer equipment. For public mobile telephone services, it includes the mobile handset or wireless cards installed in laptop computers. The customer premise equipment is generally not owned by the service provider (although sometimes leasing and/or management services are provided by the service provider).

The access network interconnects customers to the core network. Access networks can be constructed using copper wires (or coaxial cables in television distribution networks), optical fibre (usually used for very high speed commercial services) or wireless (fixed radio equipment, mobile cellular networks or satellite networks). Combinations of these technologies may be used to best suit available infrastructure and provide economic service delivery. Access networks in general are relatively simple, with most of the intelligence provided in the core and application layers of the end-to-end network.

The core network is the engine room of the telecommunications network. Here services are switched and interconnected, and routed to their destination as required. The core network consists of circuit switches (such as local telephone exchanges or mobile switching centres), data switches and routers (for legacy data and Internet based networks), and transport equipment (optical fibre and digital microwave based transmission networks). All interconnection between various networks is performed in the core or between the core networks of different service providers.

The application network provides the control plane for the network, as well as providing content or transaction based services to the customers. The telecommunications network evolved from manual service connection (in the days of manual, operator driven switchboards), through automated switching (with signalling and control processors embedded in digital switching equipment), to the separation of the intelligence from the core switching equipment onto application servers providing common control functions for the entire network. This separation of the control logic and switching functions has formed the basis for the convergence of voice services onto advanced data networks, providing service providers with a powerful but extremely efficient total service solution across one consistent network structure. Voice over Internet Protocol (VoIP) uses this application based approach to service delivery.

Other than for controlling the network, there are other aspects of the application network. The various forms of content exist in this layer, such as web servers and video/audio content (such as television and radio channels), and are accessed by the customers through the access and core layers. Content delivery is generally a one-way service with the bulk of the information being provided from the application to the customer, although navigational control information flows from the customer. Other transaction-based applications also exist, such as messaging (voicemail, email, IM and unified messaging systems), where duplex communications are the norm.

The GII model allows any desired market deregulation to be considered, with the various interconnection points between layers of the network (or within the layers themselves) to be specified and regulated. Overlaying on top of the GII model is the operational model of the service provider. The operational model includes all of the front and back office systems and processes to provide functions such as network management, customer care and billing. Often additional standards and regulations are required in these areas to ensure fair practice and customer protection (such as billing accuracy standards, codes of practice for customer acquisition, land access etc.).

4. OPERATIONAL SEPARATION MODEL

Operational separation refers to the division of a facilities based service provider into two functions: the network that provides all services, and the non-network processes that interface with the customers. Separation of these functions is critical in any service provider to fully understand their cost of service and allow them to effectively manage and operate their business. It became more significant as telecommunications markets deregulated, where the previous monopolistic incumbent service provider was not only providing its own retail services to end customers, but also providing wholesale services to its competitors to allow them to provide service without complete duplication of the facilities. The minimum operational separation (where the retail non-network processes purchased wholesale services from their network organisation) allowed competitors and regulators to ensure the incumbent provider was not using predatory power and unfair accounting to maintain their market position.

Service providers that implement operational separation will generally have a network organisation (with its own profit and loss accounting visibility) and one or more service organisations. These service organisations may be focused on specific technologies (such as public mobile services) or more often are aligned with various customer segments (such as consumers, small businesses, corporations and governments). These service organisations contain all the sales, marketing, customer service and financial operations. If the service provider also provides wholesale services to others, there will generally be a separate wholesale services organisation, containing a very small sales (account management predominantly) and billing functions. The retail provider as part of their own business provides the other customer facing functions. The operational separation model is shown in Figure 4-1.

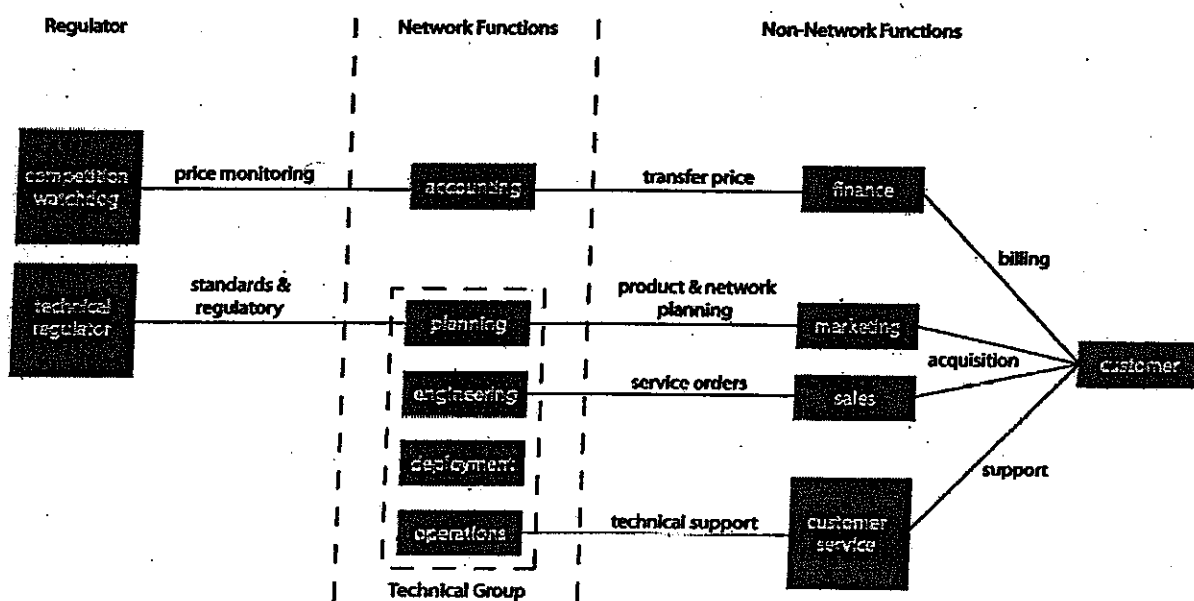


Figure 4-1 - Operational Separation Model

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When the two operational entities are established as companies in their own right, the model is often referred to as NetCo/ServCo. Multiple ServCos can be established to provide effective competition.

5. PNG TELECOMMUNICATIONS FRAMEWORK MODEL

As there is currently only one facilities based telecommunications carrier in PNG, implementation of a separation model allows the Telikom network assets to be refurbished and enhanced for use by multiple service oriented companies who procure wholesale services and compete for customer business. This approach prevents the current planned triplication of infrastructure in selected locations, allowing greater locations to be covered with significantly less capital expenditure. Lower capital expenditure, greater coverage and competitive service retailers will lead to much better and lower cost service for customers. The acronyms used for these various operating companies are used purely for clarification within this document and it is expected that full branding activities will be undertaken as required.

The retail service functions currently within Telikom are to be moved into two stand-alone service companies. The first will compete for public mobile services (TServCo-Mobile or TSM), with the second providing fixed and non-mobile services (TServCo-Fixed or TSF). Marketing, sales, distribution, customer care and finance departments will be established in each of TSM and TSF. TSM is similar to Pacific Mobile Communications (PMC) prior to the re-integration with Telikom, although contains none of the network assets it previously owned (these stay within NetCo). Operation of TSM is under a model of a Mobile Virtual Network Operator (or MVNO).

Two competitive ServCo licenses are awarded to the two international companies who were successful in the ICCC conducted tendering process (albeit after negotiation and change of scope). For the purposes of this document, these are referred to as NS1 and NS2. These two companies will be established as additional MVNOs, with all public mobile service providers (TSM, NS1, NS2) utilising the same wholesale network (NetCo). NetCo is responsible for all wide area network infrastructure. Currently, there are a number of Value Added Service providers (4) who offer ISP services over their own broadband wireless infrastructure. Over a specific period of time, these service providers must migrate onto equivalent (or better) NetCo provided infrastructure and move purely to a ServCo structure. Any in-building equipment owned and operated by these service providers will remain as part of their business, being beyond the identified network boundary for the building. For the purposes of this document, these are referred to as IS1 through IS4.

A high level view of the PNG Telecommunications Framework model is shown in Figure 5-1.

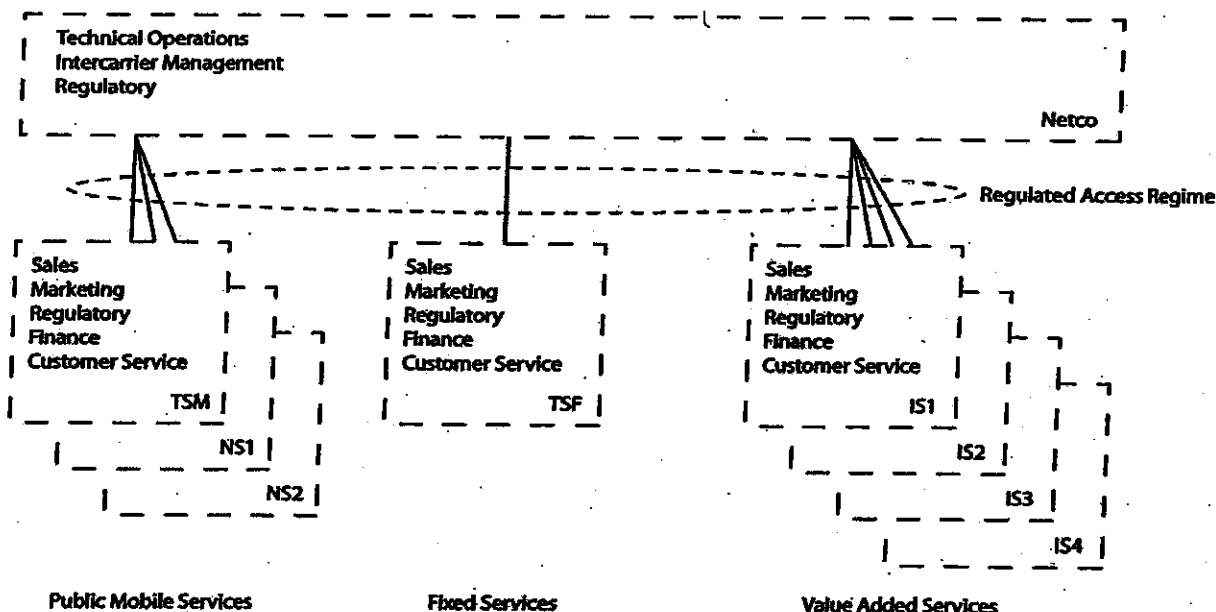


Figure 5-1 - PNG Telecommunications Framework Model

6. REGULATION AND CO-ORDINATION

6.1. Access Regime

With each ServCo purchasing wholesale services from a single NetCo, the access regime is relatively simple. Wholesale services are purchased via a rate card of services, commonly applied to all parties. Consistent volume discounts are also applied, providing a level of economic benefit to the ServCo for higher usage.

Access rates are established to provide a guaranteed return on the network infrastructure as well as ensure that ongoing investment and maintenance is conducted. A small annual management fee per customer is also applied to cover administration and operational support. Rates are calculated for all types of services offered, including national and international termination. Access rates will be monitored via the ICC to ensure fair trade practices are being utilised and no predatory or unfair pricing is made.

The goal will be to produce an access rate card that allows for significant price competition amongst the ServCos. The specific rates for each service shall be derived by NetCo from the cost of service delivery, agreed return on investment, ongoing network expansion and operations and maintenance costs. Once agreed, the rate card will be regulated by the ICCC. A process must be established that allows controlled adjustment to the rate card at an agreed frequency (e.g. quarterly or bi-annually) to cater for cost adjustments.

6.2. Network Coverage

With the duplication and triplication of facilities prevented through the implementation of a NetCo/ServCo model, enforcing network coverage is less of a regulatory role but more of a planning and co-ordination function. The goal of the NetCo will be to provide the maximum network footprint with the highest grade of service to all ServCo customers.

A network coverage co-ordination forum is to be set up, with participation from the relevant parties. This forum will be chaired and managed by the NetCo planning department and be used for co-ordination of network expansion plans.

6.3. Community Service Obligation

One of the benefits of the NetCo/ServCo model is the ability to ensure network expansion and development to support Community Service Obligations (CSO). These obligations involve the making available of basic telecommunications services to centres with 500 or greater population. The rehabilitation of the network will facilitate such service delivery.

Each ServCo shall make contributions to meeting the CSO obligation through a financial payment to NetCo each year, the figure being an agreed and regulated percentage of annual revenue. ICCC shall regulate the CSO contribution and have the right to audit the financials of each ServCo to ensure correct calculation of the contribution amount. The payments will be collected into a separate fund for use by NetCo for CSO deployments. The ICCC shall approve the allocation of funds by NetCo for such purposes.

6.4. Permitted Attachments

Customer equipment to connect to the network must meet strict and stringent technical and operational specifications. These specifications and compliance to such are the responsibility of Pangtel. Processes are to be established that allow a ServCo to introduce new customer equipment to allow them to innovate and differentiate their services, including compliance testing to protect the network from non-conforming equipment.

6.5. National Numbering Plan

To facilitate effective expansion of the network, a national 8 digit number plan must be introduced. This not only provides enough numbers for expansion of the customer base for public mobile services, but also provides the potential to provide innovative fixed to mobile service integration and ServCo number portability. With a single NetCo, the usual complex and expensive Mobile Number Portability (MNP) solutions are not required, providing end customers with the ability to change ServCo providers and retain their mobile number. This is a significant advantage to end customers, without any operational or economic overhead required to implement the feature.

One significant digit is to be used to identify public mobile services (such as 6xxx xxxx). Another significant digit can be used for fixed line services, and existing numbers in both ranges should be maintained. This allows customers to only remember the addition of a single digit to call existing numbers. Other additional significant digit ranges should be reserved for fixed to mobile replacement, IP based voice services, and all other existing special services. The specifics of the number plan shall be agreed between Pangtel and NetCo.

6.6. Private Networks

A number of private radio networks have been authorised by Pangtel to overcome historical service delivery problems by Telikom. The ongoing allowance of such practices must be reviewed with the goal of providing such services through the fixed line ServCo (TSF). This review shall occur post policy implementation and involve ICC, Pangtel and NetCo.

In no instances shall wireline (cable) based networks be permitted to carry services between buildings, other than via services provided by TSF or other licensed fixed line ServCo and using NetCo facilities.

6.7. Spectrum Management

The role of spectrum management is two fold: participation and harmonisation with the global radio standards and operating regimes under the ITU-R; and to allocate spectrum use within the country.

Specific allocation of spectrum bands is not required under the separation model, as NetCo is the only authorised user of specific terrestrial spectrum (such as GSM, WiMAX etc.). Depending upon the outcome of whether private radio networks are allowed or not, some spectrum allocation and management by Pangtel may be required. Pangtel shall maintain its harmonisation role with the ITU-R.

6.8. Technology Development

The NetCo planning group will manage and co-ordinate a network and technology development forum. This forum will facilitate the introduction of new technology into the network for ServCo use.

7. TELIKOM WHOLESALE (NETCO)

The existing Telikom organisation will be split between the NetCo and two ServCo companies. NetCo will provide all services under regulated access to all ServCo companies and will be the national facilities based network provider. NetCo will retain all of the network assets of the previous Telikom organisation. NetCo will not market its services publicly, and retain a small account management function for relationship management with each of the ServCo companies.

NetCo will be an efficient and responsive wholesale service provider. A major refurbishment project must be undertaken to rehabilitate the current network and provide capacity for growth in mobile and other services. Advanced operational and billing systems will be deployed to drastically improve the quality of customer service provided to both the ServCo companies and their customers.

The technical network functions will consist of planning, engineering, deployment and operations. The planning organisation will be responsible for the design and architecture of the network, the technology platform, technical regulation and co-ordination functions for aspects of the business such as network footprint/coverage etc. The engineering function will be responsible for all detailed design and documentation of the network. Deployment is responsible for the installation and commissioning of all network elements and infrastructure, and the operations function is responsible for operating and maintaining the network. The operations group will also provide technical support services to the customer support functions in the various ServCo companies (who deal with the customers). NetCo also has financial and administration functions to provide billing and regulatory support.

ServCo companies will interface with NetCo via automated processes and systems, as well as operational human processes to provide Activation, Assurance and Accounting functions.

8. TELIKOM FIXED LINE SERVICES (TSF)

The fixed line retail business is split out of the previous Telikom organisation into a stand-alone ServCo company. Marketing, sales, billing, customer service and logistics functions are required, along with administration and other financial/governance functions to allow the ServCo to operate in its own right. Existing fixed line voice telephony and data services will be moved into this entity.

9. PACIFIC MOBILE SERVICES (TSM)

The public mobile telephone service retail business is split out of the previous Telikom organisation into a stand-alone ServCo company. Marketing, sales, billing, customer service and logistics functions are required, along with administration, regulatory and other financial/governance functions to allow the ServCo to operate in its own right. Existing mobile telecommunications services will be moved into this entity.

10. NEW PUBLIC MOBILE SERVICE PROVIDERS (NS1-2)

Two new public mobile telephone service companies will be allowed to be established. In all likelihood, these will be the two companies who have been awarded previous facilities based mobile licenses although there could be some hesitancy on their part to operate under the separation model (as this could be a materially different business they are not happy with). It is expected that this be ratified with each of them as part of the post policy adoption.

The two ServCo companies will likely be structured similarly to the TSM ServCo.

11. VALUE ADDED SERVICE PROVIDERS (IS1-4)

Historically, four value added service providers have established facilities to offer Internet services. Whilst the infrastructure deployed by such providers operates on class-licensed spectrum for the most part, the goal is to migrate all services onto NetCo infrastructure and have these operate as pure ServCo companies. As NetCo does not have the appropriate infrastructure available initially, these organisations must be given an allowance to continue operations until such time that NetCo is in the position to provide the services. They must continue to purchase wholesale Internet transit services from NetCo.

12. PNGARNET

Higher education and universities are often early adopters of very high bandwidth services. In Australia, AARNET (the Australian Academic Research NETwork) has its own carrier license and operates a national optical backbone for very high-speed interconnection between the member universities and the Internet. The Vice Chancellors Committee of PNG has committed to launching a similar research network called PNGARNET.

Rather than allow PNGARNET to build its own facilities, it should be granted a ServCo license to allow it to procure wholesale services from NetCo and provide it to its member educational institutions. It shall not be allowed to provide services to those outside of these institutions. This should be reviewed by the ICT Licensing Committee.

13. IMPLEMENTATION PLAN

13.1. Phase 1

Phase 1 establishes the various committees and structures to facilitate and manage the deregulation process and adoption of the ICT policy.

Implementation of the policy and deregulation requires management and reporting to relevant parties and to ensure that milestones are met and achieved in the shortest possible timeframe. The ICT Policy Overseeing Committee will be chaired by an independent party, with representation from Telikom (NetCo), PEIDC, ICCC, Pangtel, National Planning and Monitoring, and Treasury as required.

The primary role for the ICT Policy Overseeing Committee is for the creation and sign off of the detailed deregulation project plan, then monitoring and reporting against this project plan as it progresses. This committee will be responsible for acknowledging the completion of any milestone, and the sign off of any phase prior to commencement of the next.

The generation of the detailed plan and milestone signoff procedure must be completed prior to the commencement of any of the deregulation phases, and estimated to take approximately 4-6 weeks and to be completed no later than mid September 2007.

The ICT Licensing Committee is to be established. This committee has participation from ICCC and PANGTEL, with PEIDC representation if required. This committee is responsible for analysing and recommending for approval any ServCo license. Approval is granted by the Minister for PEIDC based upon this committees recommendations. Terms of reference and codes of practice for each committee shall be created in this phase.

13.2. Phase 2

Phase 2 is for the finalisation of the various regulatory aspects of the deregulation model, as well as the financial and operational separation of Telikom into NetCo and its two ServCo companies (TSM, TSF). The fund to hold the ServCo CSO contributions must also be set up, along with the processes for allocation and access to various CSO projects. The ServCo licenses shall be awarded at the end of Phase 1, allowing them to prepare for operational testing in Phase 3 and commencement of services after that phase is completed.

Regulatory codes are required (either new or amended) that cover Community Service Obligations, Numbering, Spectrum Management and Permitted Attachments. Licenses must be created for each of the ServCo companies, and for NetCo. These licenses must detail what is required for each organisation and what responsibilities each of them have and how they are to operate (with respect to regulation and policy). The ServCo licenses shall also detail their contribution to the Community Service Obligation fund.

The two ex-Telikom ServCo companies (TSM, TSF) should be financially separated although maintain current process for service delivery to ensure current customers continue to receive the services they are paying for. They should commence planning and implementation for their stand-alone operation post full formal separation commencement at the end of Phase 5 of the implementation process.

Negotiation with each of the two recently awarded mobile carrier licensees must occur, agreeing to the migration of their operations into a ServCo structure. It should be possible to transfer any network infrastructure built by these two licensees into NetCo under agreed terms, which will not only cover the capital expense undertaken by these carriers, but allow a quick increase in NetCo network capacity. It is expected that this will be applicable for Port Moresby and possibly Lae where they may have started construction ahead of their expected service start date of 17th October 2007.

The ICT Licensing Committee will also generate any required tender documentation for ServCo licenses that will be released as part of phase 3.

It is expected that Phase 2 will take approximately 12 weeks to complete and be completed no later than 28 December 2007.

13.3. Phase 3

Phase 3 completes the detailed documentation and operational processes required and is considered the operational readiness phase. The ICT Licensing Committee shall also conduct any required ServCo tender processes during this phase.

The access regime and cost recovery model must be generated and agreed in this phase. This will form the basis of the billing structures between the NetCo and ServCo companies. This requires the establishment of a NetCo financial network and operational model that represents the various cost components of the network operation. Cost recovery must not only cover the network and operational components used by the service, but also include:

- Agreed return on invested capital (ROIC) required

- Technology lifecycle management
- Ongoing network expansion
- NetCo regulatory and co-ordination fora participation
-

NetCo must generate its 3-5 year network strategy and commence its network refurbishment program. This strategy must accommodate the expected demand from the ServCo companies as well as provide for ongoing expansion of the network coverage beyond the 229 required locations. Each aspect of the network and operational systems must be covered. NetCo operational and capital plans will be derived from this strategy work. NetCo shall commence operating as a separated wholesale entity as soon as practical, ensuring current customers are not adversely affected by the changes.

Once this network plan is created, NetCo shall establish the Network Planning Co-Ordination Forum. This forum is to manage the expansion of the network footprint and have participation from the various ServCo planning groups, ICCC and Pangtel. As part of this forum, processes to allow the ServCo companies to influence the network expansion shall be established.

NetCo will establish the wholesale billing interfaces to the network, as well as the various provisioning interfaces and customer support interfaces. These various interfaces are for the ServCo companies to conduct business with NetCo and provide efficient and automated operations where possible. Documentation relating to these interfaces and processes must be generated as part of this activity. As a minimum, the following processes are required:

- Ordering and Provisioning (O&P)
- Operations and Maintenance (O&M)
- Billing and Reconciliation

It is expected that Phase 3 will take approximately 8 weeks to complete and be completed no later than 29 February 2008.

13.4. Phase 4

Each of the ServCo companies who are participating in the initial launch (post Phase 5) shall establish their own operations linking to these interfaces and working with the developed processes. Once these interfaces and processes have been implemented and tested, operational readiness is declared. Operational readiness must be achieved with at least one ServCo to trigger completion of this Phase.

There are also two other fora established by NetCo with participation by the ServCo companies. The first is the Operations & Maintenance Forum, which is used to handle real time operational network issues. Activities such as network growth (capacity) and scheduled maintenance are handled in this forum. The second is the Service Assurance Forum, which is the overseeing forum over assurance, congestion management and quality of service management.

Agreement on the testing for the business readiness phase (Phase 5) is required from all participating parties. This testing is to ensure that all required processes and functions are ready for commercial operations. NetCo is to be the prime on the generation of such test plans although individual sign off with each of the ServCo companies is required.

It is expected that Phase 4 will take approximately 8 weeks to complete and must be completed no later than 25 April 2008. There are many activities that must occur in this phase and focus is required by all participating parties to ensure timely completion and success.

13.5. Phase 5

Phase 5 is considered the business readiness testing phase. Business readiness verifies all aspects of the activation, assurance and accounting functions between the organisations and ensures that the regulatory framework is adhered to.

NetCo will also establish the Technology Planning Co-Ordination Forum, which is the forum for ongoing technology enhancement to the network. To maintain a level of confidentiality between the ServCo companies, individual secondary fora will be established (under the overall forum framework) for each ServCo.

Once business readiness testing has been completed with at least one ServCo, this phase can be completed and commercial operations can commence. Each ServCo can commence commercial operations once they complete their specific business readiness testing.

It is expected that Phase 5 will take approximately 4 weeks to complete and be completed no later than 1 June 2008.