



# Licensing for growth



Reforming the licensing of mobile operators  
in developing countries

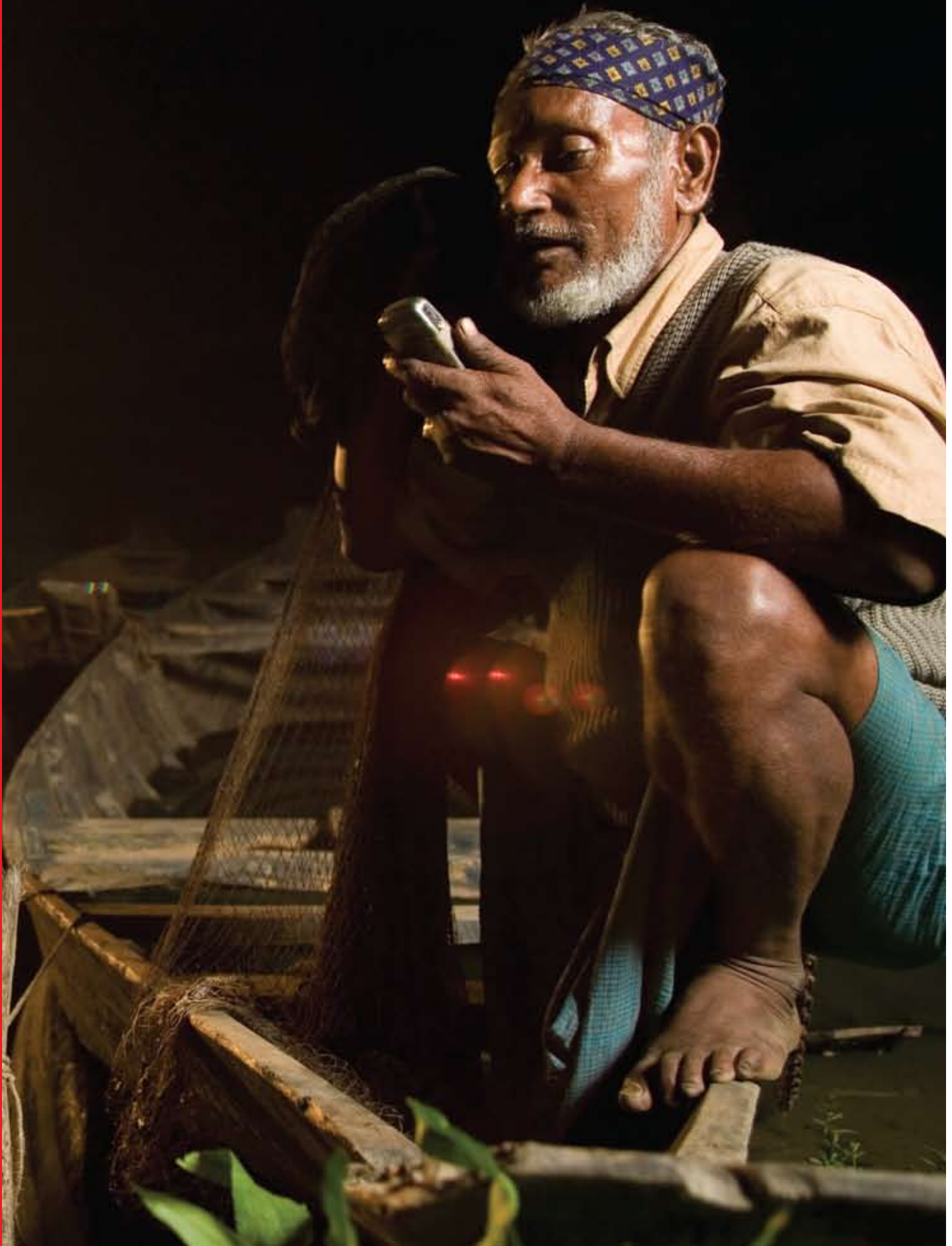
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# 1

## Introduction



## Executive Summary

A country's licensing regime can critically impact the development of the mobile industry as well as the economy more generally. Getting the licensing regime right and ensuring that it remains appropriate, as technologies and markets develop, is therefore an important concern of governments. The GSM Association has commissioned Case Associates to examine key licensing issues that are particularly relevant to developing countries. In this report, we analyse the nature of the issues, review international experience and present a programme of practical reforms that licensing authorities should consider to support the ongoing development of their communications industries.

## Reforming the overall licensing framework

**Traditionally, an operator's licence contained the full set of rules specific to the activities of the operator, including rights to undertake particular activities and, potentially, rights to the use of particular spectrum, as well as the range of price and non-price obligations the operator was required to meet.**

Given the current pace of technological developments, extensive licensing requirements risk inhibiting operators in making the best use of their networks to supply services and risk delaying investment required to introduce new services.

Detailed licences that are specific to one operator, type of service or network also risk distorting competition if operators supplying competing services face different licence conditions.

A growing number of countries are instead introducing more flexibility in operating licences (while retaining specific licences for the use of spectrum). Some countries have introduced unified or converged licences, in which a single licence type applies to a wide range of services and network technologies. Class licences have also been introduced, providing the right for anyone to supply services of a particular type or class. Some countries have gone further and have abolished operating licences in favour of general authorisations in which different types of networks can be developed and services supplied without specific approval being required by a licensing authority.

While greater flexibility in the drafting and terms of operational licences is desirable, there are important transitional issues that need to be addressed. Achieving regulatory objectives such as controlling market power through alternative targeted measures require these measures to be in place before specific provisions in operating licences are removed. Further, operators have invested on the basis of their original licensing arrangements and any changes to these arrangements should take into account investors' legitimate expectations. In practice, this may mean liberalisation earlier in some areas than others or the payment of compensation where changes are made in conflict with expectations.

Licences for the right to use particular spectrum bands, on the other hand, do require detailed provisions to manage scarcity of the resource and interference. Indeed, in many developing countries there is too little information on the current usage and rights to use spectrum, thereby creating a greater risk of interference, impacting service quality and inhibiting investment in future services. Improved spectrum management could help address current spectrum shortages, improving service provision and reducing costs. Establishing a long term spectrum plan, including a schedule for releasing additional spectrum, that recognises the benefits of ITU and regional coordination and standardisation would support investment planning and reduce business risks.

## Following are our key recommendations in relation to reforming the overall licensing framework

### Recommendation 1

**Governments should ensure that the overall licensing framework offers stability and transparency to reduce regulatory risk and promote investment.**

Key principles to be followed include, where required: establishing and adequately resourcing an independent regulator with responsibility for licensing, among other matters; announcing in advance a long term plan for reform of the licensing framework and spectrum management; in such a case, publicly setting out the criteria and process to be followed in licensing decisions and including public consultation in advance of key decisions being made; taking into account investors' legitimate expectations and considering compensation where decisions are made in conflict with those expectations.

### Recommendation 2

**Licensing authorities should ensure that operating licences do not unnecessarily restrict an operator's choice of services and technologies. Greater use of authorisations and class licences should be considered.**

However, the extent and speed at which flexibility is introduced should take account of: (i) the need for certain rights and obligations to be established by separate regulation; (ii) recognition of existing licensees' legitimate expectations or negotiated compensation where changes are inconsistent with their legitimate expectations; and (iii) ensuring operators offering similar services are subject to similar rights and obligations so that competition is not distorted.

### Recommendation 3

Governments should separate operating licences from licences for the use of spectrum, to assist changes in business activities and spectrum holdings and to support evolution of technologies and the different needs of radio spectrum management and the other aspects of the licence.

### Recommendation 4

Governments should consider the need for a spectrum audit to set out in detail the current usage and current rights to use spectrum, identifying which spectrum is currently idle.

### Recommendation 5

Governments should develop a plan setting out when they will release particular bands of spectrum, with the use or uses of particular bands being determined to maximise overall benefits from the use of the spectrum, including taking into account the benefits of international harmonisation.

## Assignment and renewal of licences

The choice of approach for assigning mobile licences and detailed design questions should be determined taking into account the government's objectives as well as the particular market context. In the context of determining whether a licence approaching its expiry date should be renewed or reassigned among operators, key concerns should be the serious risk of freezing new investment, that can be created by uncertainty about renewal, and continuity of service for consumers.

Whether an auction or beauty contest is adopted, importance should be attached to the detailed design, clarity and transparency of the approach.

Following are our key recommendations in relation to the assignment of licences and the approach to licence renewal.

### Recommendation 6

**There should be a presumption in favour of licence renewal for mobile licences to encourage long-term investment and minimise the risk of service disruption to customers.**

Non-renewal of a licence may also involve large costs in changing networks and rolling out new infrastructure. Reasons for not renewing licences should be limited to spectrum replanning (such as following an ITU World Radiocommunications Conference decision) or where there has been a serious and non-remedied breach of licence conditions. Exceptionally, a licence may not be renewed in relation to the whole or part of the relevant spectrum so as to promote competition. However, before not renewing a licence for this reason, regulators should first: (i) assess whether competition is already effective in the market; (ii) identify whether competition can be promoted by other means such as the release of alternative spectrum; and (iii) assess whether the expected competition benefits will exceed the potential costs such as in relation to customer migration and the risk of deterring investment.

### Recommendation 7

**Re-auctioning spectrum at the end of the licence should be limited to situations in which there is a reasonable prospect that spectrum will be re-assigned between operators (or where additional spectrum is being made available).**

In most cases, the existing operators would be expected to re-acquire the licence with the consequence that an auction only creates unnecessary uncertainty, market disruption and costs.

## Licence fees

The level of licence fees can significantly impact market outcomes, including the number of players that enter the market and, particularly where annual charges are levied, the prices for mobile services.

There is a strong economic case to avoid the level of licence fees being determined on the basis of revenue maximising objectives. Rather, licence fees should be used to help recover the administrative costs of the licensing process and of managing spectrum and, in some circumstances, to encourage efficient spectrum use.

Following is our key recommendation in relation to licence fees.

### Recommendation 8

Licence fees should generally be limited to recovering the administrative costs of the licensing process and associated regulatory costs (including spectrum management costs). However, where there is excess demand for spectrum, then an auction or administrative assignment of spectrum with a charge set in line with the Marginal Forward Looking Opportunity Cost (MFLOC) of spectrum should be considered. Indexation or benchmarking may prove a practical means to estimate MFLOC in particular circumstances. The MFLOC should be estimated conservatively to reduce the risk that valuable spectrum will be left idle. The relative merits of upfront licence fees versus annual charges should be considered with regard to the particular market circumstances.

## Reviewing non-price terms and conditions

**Many governments have traditionally included a range of terms and conditions in licences which go beyond those necessary for the intrinsic purpose of the licence, namely to authorise market access and/or manage the use of spectrum.**

However, licence conditions tend to be relatively inflexible and can create the risk of market distortions, as competition develops in telecommunications markets. Alternative, targeted regulation is likely to better achieve particular goals such as the control of market power or the promotion of universal access.

Following are our key recommendations in relation to non-price terms and conditions.

## Recommendation 9

Governments should introduce licence terms for mobile operators that are in line with the expected payback period for the investments.

## Recommendation 10

As an alternative to licence obligations, Governments should determine whether universal access and competition objectives can be better achieved through policies that help to change the underlying economics of extending access or entering the market or through alternative targeted regulation.

# Refarming

3G technology offers significant technological advantages and consumer benefits compared with 2G technology. However, its use to date has been limited to a relatively high frequency band, particularly at 2100MHz. The ability for operators to refarm lower frequency bands, currently used for 2G services, is estimated to generate substantial economic benefits, including providing mobile broadband to rural and remote areas. For this to happen, a sufficiently large market must be created by the harmonisation of the use of 2G band for 3G; allowing economies of scale to drive down handset prices.

Following is our key recommendation in relation to refarming.

## Recommendation 11

Governments should permit spectrum currently used for 2G services to be used for 3G technologies with any implementation and competition issues being resolved as a priority so as to realise the consumer benefits from the delivery of 3G services at a lower frequency.

# Longer term reforms

In principle, the introduction of spectrum trading and liberalisation offers significant economic benefits through promoting more efficient spectrum use. However, there are significant implementation issues associated with greater liberalisation and experience remains limited, even in developed countries.

This is particularly the case when an operator wants to change to a completely different technology, as opposed to implementing upgrades. It can be particularly difficult to quantify the potential interference impact on other spectrum users without detailed engineering studies. Such engineering studies are generally very specific to the particular technologies and services used. Nonetheless, once experience grows in more mature markets, developing countries should also consider steps to support greater liberalisation of spectrum management in the longer term. However, if the spectrum trade involves no change in technology (i.e., a GSM operator selling spectrum to another GSM operator) then interference should not be an issue (all other things being equal).

Following are our key recommendations in relation to spectrum trading and liberalisation.

## Recommendation 12

There continue to be significant costs and risks associated with the general introduction of spectrum trading and liberalisation in developing countries at this stage and licensing authorities should therefore consider whether to approve particular proposed trades or changes in use on a case-by-case basis, subject to consultation and detailed examination of any risk of increased interference.

## Recommendation 13

To facilitate the longer term introduction of trading and liberalisation, licensing authorities should consider whether there is a need to provide greater clarity over current rights to use spectrum, particularly in regard to key parameters such as frequency, geography and allowable interference/power levels.

Finally, we note that while a favourable licensing regime is important to the successful development of a country's communications industry, other factors are also important. In particular, the health of the industry will also depend on governments pursuing sound overall economic and fiscal policies, which do not penalise the communications industry, an institutional framework and regulatory approach that reduce regulatory risk and protect incentives for both local and foreign investment, achieving high investment in supporting economic and social infrastructure including energy, transport, education and health.

# 2

## Reforming the licensing framework



## Introduction

Traditional licensing frameworks for electronic communications required individual licences for the delivery of specific services over specific networks. Many traditional licences also set out an extensive set of rights and obligations attached to the licence. However, technological development and convergence are increasingly enabling individual networks to offer a greater range of services as well as creating the potential for greater competition between networks.

The GSM Association has commissioned the Competition Economists Group to explore how licensing frameworks can be developed to realise the full potential of technological change as well as to promote investment and competition going forward. A particular focus is in developing practical recommendations of priority to licensing authorities in developing countries.

Key issues addressed in this report include introducing more flexibility in general operating licences; ensuring that spectrum licensing enables a country to maximise the benefits from its spectrum resources both in regard to the initial assignment of spectrum and in considering the issues raised by licence renewal; pricing licences so as to encourage efficiency and to ensure high levels of investment; determining how best to achieve particular regulatory and universal access objectives and measures to support technological evolution; and more liberalised spectrum management in the longer term.

While the GSM Association has provided information to assist in the compilation of this report and supports its recommendations as a general guide to best practice in licensing, we note that the specific recommendations may need to be adapted to the particular circumstances in specific countries.

## Reforming the licensing framework

In this section, we consider the overall framework for licensing electronic communications. We make an important distinction between approaches to the general operating licences relating to network and service provision and approaches to licensing the rights to use particular spectrum bands. Greater flexibility in operating licences is likely to be desirable to support the development of the electronic communications sector, although there are significant transitional issues to be addressed. For spectrum licensing, on the other hand, the immediate priority in many developing countries is to clarify current spectrum usage and rights and to ensure that valuable spectrum is not being left idle or underutilised. We conclude this section by considering key principles applicable to the overall licensing framework that can support high levels of investment and ensure that the licensing framework operates well to maximise benefits for consumers.

## Reforming the licensing framework

### 2.1 Operating licences

Many countries have traditionally required individual operating licences to be obtained for the supply of specified services using a specified network technology. Individual licences have been used to set out a detailed set of rules governing the activities of the operator including rights to undertake particular activities and the range of price and non-price obligations the operator is required to meet. However, there is a growing trend away from restrictive operating licences. In this section, we explain the reasons for this trend and identify emerging international best practice as well as addressing key transitional issues. We note that we are concerned in this section with operating licences for the provision of networks and services. Licences relating to the use of spectrum raise a distinct set of issues and are discussed in the following section. It is important to bear in mind that greater flexibility in relation to operating licences should not be taken as implying that greater flexibility in spectrum licensing can be achieved as readily.

Two key trends are impacting traditional licensing frameworks. First, technological convergence is enabling different network technologies (such as fixed, cable and mobile technologies) to offer competing services. Second, there is growing recognition of the benefits of competition in delivering lower cost and better quality services and in encouraging the introduction of new services. In this context, operating licences that include significant restrictions on an operator's activities can create an artificial barrier to more efficient network use and limit new network investment. Restrictive licensing can also hold back competition or distort the competition that does take place, particularly where operators offering similar services face different rights and obligations.

Many countries are responding to the technological and commercial developments by introducing more flexible licensing that enables operators greater choice over the services they offer and the technology they use to supply those services. Greater flexibility enables operators to choose the lowest cost way of supplying existing services as well as to expedite the rollout of new networks and services. Simplified licensing procedures can also free up regulatory resources.

More fundamentally, flexible licences offer the potential for greater competition as operators using different technologies supply similar services in competition with each other. International experience shows that liberalising access across the telecommunications sector supports not only the faster growth of the sector but also contributes to stronger overall economic growth. The correlation between per capita GDP and teledensity is well established<sup>1</sup>. One key finding is that telecommunications infrastructure, and the way in which this is spread across the population, is a significant driver of economic growth. A 10% increase in the penetration rate of mobile phones is associated with a boost in GDP per capita growth of around 0.59 per cent per year<sup>2</sup>.

We first review a number of more flexible licensing frameworks that have been implemented before considering important transitional issues.

1. See, for example, "W(h)ither the Digital Divide?", Carsten Fink and Charles J. Kenney, *info* 5(6), 2003.

2. "The impact of telecoms on economic growth in developing countries", Leonard Waverman, Meliora Meschi and Melvyn Fuss, Vodafone plc, 2005.



## Expanding the types of services and technologies covered

A number of countries have reformed their licensing frameworks by expanding the types of services and technologies covered by an individual operating licence while maintaining a range of licence types. At a relatively early stage, Malaysia introduced a technology and service neutral licensing regime as part of its Communications and Multimedia Act of 1999. The Act is based on four generic categories of providers:

- **Network Facility Providers, which covers owners of satellite earth stations, fibre optic cables, communications lines and exchanges, radio communication and transmission equipment, mobile communication base stations and broadcasting towers and equipment;**
- **Network Service Providers, which covers the provision of basic connectivity and bandwidth to support a variety of applications;**
- **Application Service Providers, which covers the provision of voice services, data services, Internet access services, IP telephony, and other transmission services; and**
- **Content Applications Service Providers, a subset of applications service providers that includes traditional broadcast services and services such as online publishing and information services.**

These four categories replaced the previous regime which included 56 categories of licensed services and 24 categories of licensed facilities. The services falling under the four categories<sup>3</sup> were further subdivided into services requiring individual licences (with a need for specific ministerial approval), services requiring class licences (for which only registration was required) and licence exempt services. Operators could hold more than one licence at any time.

In 2005, Tanzania also introduced a similar licensing framework to that of Malaysia with four generic licence categories. The new licensing framework has been associated with a rapid increase in the rate of subscriber growth. Total (fixed and mobile) subscriber numbers in Tanzania, which have grown from 1.4 million in 2003 to 2.1 million in 2004, grew to 3.1 million in 2005 and to 5.9 million in 2006.

## Unified licensing

Other countries have introduced unified or converged licences in which a single operating licence type applies to all providers of telecommunication networks and services regardless of the technology they deploy or the services they offer.

Nigeria introduced Universal Access Services Licences in February 2006 that cover fixed telephony (including fixed wireless services), digital mobile services, regional and national long distance services and international gateway services. The new licences are available to existing licence holders who have met certain minimum requirements (e.g., existing network infrastructure, a minimum existing customer base or evidence of financial capability and being up to date with payment of regulatory charges and tax) as well as new entrants who meet

specific requirements. The ability to offer mobile services is dependent on having access to spectrum which is separately licensed. Around eight operators have already acquired Nigeria's Universal Access Services Licences including a new GSM operator<sup>4</sup>.

## General authorisations

In many developed countries, greater flexibility has been achieved by the introduction of general authorisations. General authorisations abolish the need for operators to obtain individual operating licences for the provision of networks and services. Rather, the general authorisation entitles a provider to commence offering services without being required to first obtain any explicit administrative approval (albeit they may still be required to notify the authorities and provide a minimal amount of information). General authorisations do not impose any artificial restriction on the number of providers that are able to supply services in the market, i.e., potential new entrants themselves decide whether or not the market can support their entry based on their expected returns on the investment required to enter<sup>5</sup>.

The European Union's Authorisation Directive<sup>6</sup>, effective from July 2003, required all EU Member States to replace individual telecommunications licences with a general authorisation to provide all electronic communications networks and services including fixed and mobile networks and services, data and voice services, broadcasting transmission networks and services. The general authorisation creates rights to supply services, install facilities, to negotiate interconnection and seek regulatory resolution where negotiations fail and the right to be considered for designation as the universal service provider. Obligations can also be included in the general authorisation although these must be from an approved list of potential obligations (including such potential obligations as contributing to a universal service fund, ensuring interoperability of services and interconnection, portability of numbers and rules on privacy protection and the protection of minors). Individual rights and obligations are retained only in relation to rights of way, rights to use radio spectrum, rights to use numbers, regulatory obligations that can be imposed on operators found to have significant market power (SMP) and obligations relating to universal service provision. In developing countries, authorisations tend to be used on a more restricted basis. Class licences can provide for particular services or activities that fall within that class to be undertaken without the requirement for the individual service provider to receive explicit approval to offer the service. Class licences are often used for Internet service providers, value added services and private networks. Other services such as Wi-Fi for private use may not require any explicit regulatory approval or even registration.

What matters for market outcomes is not so much whether there are four categories as in Malaysia or unified licences as in Nigeria or general authorisations as in the EU Member States, but rather the ease with which providers can establish new networks and offer new services and to minimise the risk of differences in licence conditions distorting competition. In that regard, the greater flexibility achieved across these countries can be expected to facilitate greater investment and competition to the benefit of their consumers. We turn next to consider transitional issues in introducing greater licensing flexibility.

3. Based on information in ITU, *Licensing in the era of liberalisation and convergence – The case study of the Republic of Tanzania and Emerging Market News*, Interview with Prof. John S. Nkoma, Director General of the Tanzania Communications Regulatory Authority, 15 May 2007.

4. See CIPACO, *Unified licences: what benefits for the telecoms sector*, 17 January 2007.

5. Necessary restrictions arising from spectrum scarcity are discussed in the next section.

6. Directive 2002/20/EC of the European Parliament and of the Council of 7 March 2002 on the authorisation of electronic communications networks and services.

## Transitional issues

The introduction of more flexible licences raises a number of significant transitional issues. These transitional issues may lead to greater flexibility being introduced by first expanding the types of services and technologies covered by particular licence types and only moving towards the use of general authorisations over time.

First, where detailed rights and obligations were previously included in individual licences, the relevant authority will need to review what rights and obligations should be maintained either to apply to all operators holding the more generic licences or what should be separately imposed by regulation. We discuss the review of non-price licence conditions more fully in Section 5. Here we note that many provisions included in licences that are aimed at achieving particular policy objectives (such as controlling market power or promoting access) are likely to be better achieved through separate targeted regulation. Nonetheless, such regulation can require new legislation and changes to institutional arrangements and hence the need for these changes will limit the extent to which more flexible licensing can be introduced in the short-to-medium term. Until a predictable overall regulatory framework and approach is in place, retaining certain rights in licences may also offer greater certainty for investment.

Second, legal undertakings have been made to incumbent operators in a number of countries that provide for exclusivity in the supply of particular services for a specified period. Where investments have been undertaken on the basis of one set of laws and regulations, it is important to ensure that changes do not conflict with investors' legitimate expectations so as to maintain the overall attractiveness of the country for ongoing investment. Where more flexible licences are introduced prior to the end of the incumbent operators' exclusivity period, governments should consider the payment of compensation to adversely affected parties (potentially funded out of revenues from new licences or newly relaxed licences) or alternative forms of compensation such as granting rights to offer new services or relaxing other obligations on those parties. In Malta, the incumbent operator's monopoly on international gateway services was relinquished at an early stage partly in return for the operator being allowed to commence supplying mobile services.

Third, to promote the efficient development of competition, it is also important to ensure that operators offering similar services are subject to the same terms and conditions. In particular, this can mean requiring providers wishing to offer new services to meet similar obligations as apply to the existing providers of those services. For instance, Basic Service Operators in India were originally restricted to offering only limited mobility Wireless Local Loop services (i.e., customers were only able to use their service within a single cell site area). With the introduction of India's new unified licensing regime, the Basic Service Operators were allowed to acquire unified licences allowing fully mobility services to be offered but on the condition that they paid an additional fee so that their total fee would be the same as the fourth mobile operator in that area and that they complied with similar rollout and other obligations as the fourth mobile operator.

## 2.2 Spectrum licences

Rights to use spectrum raise distinct issues regarding general operating licences. While competition between multiple providers of networks and services is generally desirable to promote better outcomes for consumers, a particular spectrum band on the other hand may need to be assigned to one user. Allowing multiple users of the same spectrum band can risk high levels of interference that would prevent some types of services from being offered at an acceptable quality of service.

For the provision of mobile services over wide areas, the risk of intolerable interference requires that the government restrict who is allowed to transmit on a particular spectrum band over a particular geographic area. Such restrictions can take several forms:

- Governments may mandate that only one specified user may transmit on a particular spectrum band using a particular technology and for the supply of a particular service (this remains the most common approach and is referred to as a Command and Control approach);
- Governments may allow some greater flexibility such as allowing users to choose from within a range of prescribed technologies or to buy and sell spectrum between each other (we addressed spectrum refarming in Section 6 and spectrum trading and liberalisation under longer term issues in Section 7); and
- Governments may allow anyone to use a particular spectrum band but restrict the type of use of the spectrum such as in terms of power constraints (this approach is known as licence-exempt use or a spectrum commons and is commonly used for short-range, low power services, such as WiFi)<sup>7</sup>.

Spectrum management is becoming increasingly important because of the growing demand for services that require the use of spectrum to be delivered. In many developing countries, the major concern with current spectrum licensing is that little information is available on the current assignment of spectrum rights, particularly in regard to who has the legal rights to use particular bands and what services and technologies they are allowed to use. The lack of information on current spectrum rights can come at a substantial economic cost including in terms of:

- Govedeterred investment, degraded quality of service and protracted disputes because of the heightened risk of interference; and
- valuable spectrum being left idle or underutilised because not even the licensing authority may have a good knowledge of the details of the spectrum rights that have been assigned in the past.

Clearly defined rights to use particular spectrum are important to prevent harmful interference and to provide the certainty to enable investment in the rollout of networks utilising that spectrum. Efficient spectrum management also requires assigning unused spectrum or re-assigning underutilised spectrum so that it can be used to support the delivery of services that are most valuable to consumers.

Following are specific measures that developing countries should consider.

7. While a number of commentators have suggested that greater use of spectrum commons is desirable, spectrum commons can give rise to significant inefficiencies including no guaranteed quality of service (particularly in urban areas), ongoing government determined restrictions on use and acting as a deterrent to investment in the band. The problems of spectrum commons are discussed in J. Brito, "The Spectrum Commons in Theory and Practice", 2007 Stanford Technology Law Review 1.

## Spectrum audit

Licensing authorities should consider undertaking a spectrum audit if there is uncertainty over current ownership of spectrum rights and usage. The spectrum audit should specify in detail which services currently use which frequency band, and by whom. The audit can also clarify current rights to use spectrum particularly in regard to key parameters such as frequency, users, use, geography and the levels of interference that are allowed so as to be compatible with other licensed uses. The spectrum audit should be focused initially on those spectrum bands<sup>8</sup> and geographic areas which are most heavily used.

A key benefit of the spectrum audit will be to identify where the current pattern of use gives rise to harmful interference that reduces quality of services and raises costs of operators in seeking to overcome the interference. Where incompatible uses are identified, a migration process should be introduced with compensation for legitimate users if licensed spectrum is required to be returned prior to the end of the licence period. In addition, where unlicensed users of licensed spectrum or users in breach of their licence conditions are identified, they should be subject to proportionate penalties.

The result of the spectrum audit should be made public to facilitate network design and longer term planning by existing and potential new users of spectrum.

## Spectrum planning

Where the spectrum audit identifies a particular spectrum band as currently being idle or where spectrum is returned, licensing authorities should then determine the allocation of the spectrum for the delivery of particular service or services. It is important that spectrum allocation decisions are made as part of a longer term plan because once spectrum has been allocated it can be difficult to re-assign. The spectrum plan should set out a schedule for the release of spectrum over time so as to facilitate investment planning by firms.

The first step in developing a spectrum plan is to determine the allowed use for particular spectrum bands. Consultation with industry is likely to be important to determine what use is likely to generate the greatest value to consumers. A key determination of spectrum use should be international harmonisation which can generate significant benefits such as in terms of accessing scale economies of equipment manufacture as well as supporting international roaming. In this regard, the broad commitments made at ITU World and regional radio conferences should be treated as a minimum with additional opportunities for international and regional harmonisation being sought. Spectrum allocation should also provide for the timely introduction of new services such as 3G and avoid creating artificial scarcity where additional spectrum is available to be assigned. Both commercial and public uses of spectrum should be considered as in many cases substantial spectrum allocated to public sector entities is left idle or underutilised.

scarcity where additional spectrum is available to be assigned. Both commercial and public uses of spectrum should be considered as in many cases substantial spectrum allocated to public sector entities is left idle or underutilised.

Where adequate spectrum is available at a particular band to meet current and forecast demand, class licences can be issued to allow use of the spectrum for particular services which has been determined as not causing harmful interference with each other or with licensed use of the spectrum. Where the demand for spectrum exceeds the available spectrum, there is a need for the regulator to choose between users. We discuss approaches to assigning individual licences in Section 3 of this report.

## Separation of operating licences from spectrum licence

Where operating licences for network or service provision are retained, it is desirable to separate these licences from spectrum licences. Such a separation can help ensure that rules in relation to network or service provision are applied in a neutral manner across technologies and operators by allowing the same licence type to be issued to all network operators and service providers. Spectrum licences can then be targeted at issues of specific relevance to spectrum use, particularly interference management. Separation can also provide operators with greater flexibility to adapt their activities or spectrum holdings over time without calling into question the validity of their overall licence. Operators that no longer require particular spectrum usage rights can then return these more readily so that the spectrum can be re-assigned where it is needed.

<sup>8</sup> Even where spectrum is not licensed to a specific use, the permitted levels of interference in relation to other spectrum bands can act the limit what services the spectrum can be used to supply.

### 2.3 Stability and transparency in the licensing framework

In this section, we identify general principles relevant to the licensing framework that can reduce business uncertainty and improve the quality of licensing decisions.

Regulatory certainty can be promoted by establishing and maintaining a transparent, predictable regulatory framework. A stable regulatory framework, in turn, can encourage new entry as well as giving confidence to the existing operators to undertake substantial investment in developing their networks and deploying new services. Regulatory stability and transparency can also avoid licensing decisions ending up in protracted legal proceedings or in harmful outcomes to consumers (see Box 1 – Licensing problems in Benin). Following are key elements that can promote regulatory stability and transparency.

- Setting out the long term plan for reform of the overall licensing framework including a schedule for introducing greater flexibility in relation to operating licences as well as the future assignment of spectrum.
- Setting out publicly the criteria and process that will be used to determine how licences will be assigned and whether licences will be renewed at an early stage (licence renewal decisions should be taken well before the expiry of the licence<sup>9</sup>).
- Establishing and publishing other aspects of the licensing environment as early as possible including but not limited to the pricing approach for licence renewal, non-price terms and conditions, and longer term plans in relation to spectrum trading and liberalisation.
- Licensing decisions should be based on a detailed assessment of the costs and benefits of a range of licensing options with particular regard to longer term impacts on investment incentives and sustainable competition.
- Ensuring that regulatory action does not conflict with investors' legitimate expectations including in relation to the planned introduction of competition and rights to continue to use spectrum based on legislation and regulatory decisions, statements and past practice.
- Assigning the responsibility for licensing decisions to an independent regulator who is required to follow specific, transparent criteria in making its decision and with an independent appeals process with the power to enforce its decisions.

- Ensuring that the regulator is adequately resourced including in relation to spectrum management functions which can require specialist monitoring equipment and technical expertise to ensure the equipment can be used effectively.
- Prior to a licensing decision being made, consultation should be undertaken to ensure that the views of different industry players and of customers can be taken into account and to help identify all the impacts of different options.
- Publishing the reasons for decisions to improve the transparency of the decision-making process and to provide guidance on the likely approach to other licensees.
- Where licensing decisions are made which conflict with a licensee's legitimate expectations or where licences are revoked before their expiry date, a commitment to pay compensation can be important to protect and maintain general incentives to invest in the sector.

International trade agreements act to reinforce sound licensing practices. In particular, the General Agreement on Trade in Services requires that authorisation requirements must not "constitute unnecessary barriers to trade" (GATS Article VI) and the Telecommunications Services Reference Paper sets out the following principles, among others, which have been incorporated in commitments made by a large number of countries:

- Where a licence is required, all the licensing criteria, terms and conditions of individual licences and time normally required to reach a decision concerning an application for a licence are made publicly available;
- The reasons for the denial of a licence will be made known to the applicant upon request; and
- Any procedures for the allocation and use of scarce resources, including frequencies, numbers and rights of way, will be carried out in an objective, timely, transparent and non-discriminatory manner and the current state of allocated frequency bands will be made publicly available.

9. A minimum period for a licence renewal decision should be determined with regard to the expected payback period for ongoing investment that relies on the affected spectrum. A minimum period of 5 years, as applied by some jurisdictions (e.g., the UK and New Zealand), is likely to be appropriate for ongoing investments in developing mobile networks.

### Box 1 – Licensing problems in Benin

A recent licensing dispute in Benin shows the problems that can arise from deficiencies in the licensing framework.

A new Government came into office in Benin in 2006. In June 2006, the regulator decided to substantially increase the licence fee for mobile operators (from FCFA 5 billion to FCFA 30 billion, i.e., around US\$62 million) and raised concerns with the 2 major mobile operators regarding changes in their names following an indirect change in control. The Government's underlying reasons may have also reflected concerns about the original licensing process under the previous Government as well as a desire to improve the financial position of the incumbent operator (with whom the mobile operators compete) in preparation for privatisation. The Government also reversed other key telecommunications reforms including dissolving the independent regulator, suspending the legalisation of VoIP and re-installing the incumbent's monopoly on gateway services.

The major operators disputed the legal basis for the new fees as the existing licences expressly prohibited any modification of the licence terms in the absence of serious grounds and that the change in indirect control had been approved previously by the Ministry. On 12 July 2007, the Government suspended the services of the two major mobile operators<sup>10</sup>.

A new agreement between the Government and the operators, brokered between the Presidents of Benin and South Africa, was finally reached only in September 2007 enabling the commencement of the operators' services. The operators accepted the payment of a higher licence fee spread over a number of years as well as service commitments and in return will be afforded tax relief on imported equipment and an extended licence term. However, little ongoing protection is provided by the new agreements for the licensees.

The Government's approach of suspending the operators' services came at a large overall economic cost to Benin including that almost 1 million subscribers lost access to their mobile phones for 2 months (despite mobile phones representing the main means of telecommunications), business activities across the economy were disrupted by the loss of their mobile communications and the Government's demonstrated willingness to retrospectively change licence conditions is likely to have harmed Benin's overall attractiveness to foreign investment.

## Reforming the licensing framework

### 2.4 Recommendations

Following are our key recommendations in relation to the overall licensing framework.

**Recommendation 1** – Governments should ensure that the overall licensing framework offers stability and transparency to reduce regulatory risk and promote investment. Key principles to be followed include where required: establishing and adequately resourcing an independent regulator with responsibility for licensing among other matters, announcing in advance a long term plan for reform of the licensing framework and spectrum management; in such a case, publicly setting out the criteria and process to be followed in licensing decisions and including public consultation in advance of key decisions being made; taking into account investors' legitimate expectations and considering compensation where decisions are made in conflict with those expectations; and establishing an independent regulator and adequately resourcing that regulator.

**Recommendation 2** – Licensing authorities should consider introducing greater flexibility in operating licences including expanding the range of services and networks covered by an individual licence and the greater use of authorisations and class licences. However, the extent and speed at which flexibility is introduced should take account of: (i) the need for certain rights and obligations to be established by separate regulation; (ii) recognition of existing licensees' legitimate expectations or negotiated compensation where changes are inconsistent with their legitimate expectations; and (iii) ensuring operators offering similar services are subject to similar rights and obligations so that competition is not distorted.

**Recommendation 3** – Governments should separate operating licences from licences for the use of spectrum to assist changes in business activities and spectrum holdings and to support evolution of technologies and the different needs between radio spectrum management and other aspects of the licence.

**Recommendation 4** – Governments should consider the need for a spectrum audit to set out in detail the current usage and current rights to use spectrum and identify which spectrum is currently idle.

**Recommendation 5** – Governments should develop a plan setting out when they will release particular bands of spectrum with the use or uses of particular bands being determined to maximise overall benefits from the use of spectrum including taking into account the benefits of international harmonisation.

10. Reuters, "Etsalat unit to discuss Benin mobile network spat", 16 July 2007.

8. Even where spectrum is not licensed to a specific use, the permitted levels of interference in relation to other spectrum bands can act the limit what services the spectrum can be used to supply.

# 3

## Assignment and renewal of mobile licences

Where a limit is imposed on the number of operators in a market, whether because of spectrum scarcity or other reasons<sup>11</sup>, there is a need for the government to determine which operators should obtain a licence. In this section, we first evaluate the general advantages and disadvantages of administrative approaches versus market approaches for assigning licences. We then focus on an issue that regulators across the world are increasingly facing, i.e., as initial licences for mobile operators approach their date of expiry, should the operators' licences be renewed or should a new assignment process be undertaken that may lead to the licence being assigned to a different operator.

11. In this section, we focus on licences for the right to use spectrum as it is in relation to spectrum where the number of licences issued going is most likely to be fewer than the demand for licences so that governments face a choice as to which operators should be licensed to use the spectrum



### 3.1 Administrative versus market-based approaches

The two main approaches for assigning a licence are: (i) administrative approaches in which the licensing authority chooses which operator to licence based on a number of criteria (such approaches are sometimes called ‘beauty contests’); and (ii) market based approaches such as an auction in which the licence is assigned to the highest bidder (with that bidder either paying the amount of its own bid or in some cases the amount of the second highest bid). It is also possible to combine aspects of the two main approaches such as where the licensing authority initially selects a short-list of bidders based on administrative criteria and then holds an auction to assign the licence between the bidders.

Administrative approaches are often seen as desirable on the grounds of allowing a range of criteria to be taken into account such as where applicants present plans for coverage extensions and the introduction of new or higher quality services. Administratively set licence fees are likely to be below the fees that would be determined at auction and this can improve operators’ ongoing financial viability to assist in raising capital for network investment. Administrative approaches may also be cost efficient where there is no real competition for the licence such as where sunk costs imply that only one particular operator is expected to win any competitive process. On the other hand, administrative approaches may result in licences being assigned to the operator that presents an attractive proposal rather than necessarily the operator that can use the licence to generate the greatest benefits for society. There are a number of cases in which commitments provided at the time of licence renewal are later not met. Administrative discretion is also more vulnerable to bias or even corruption of officials and perceived bias can lead to administrative approaches ending in legal disputes. This typically occurs in instances where clear tender procedures and evaluation criteria are not applied. Finally, while there are grounds to believe that high licence fees will have a limited impact on future investment (in terms of that investment being based primarily on the expected returns on that future investment), it may be the case that high licence fees increase an operator’s cost of capital and this can result in lower investment than otherwise.

Auctions have the desirable property of assigning the licence to the operator that attaches the highest value to the licence, which will generally be the operator that can generate the greatest benefits to society from the licence. While the final assignment will be determined by price, non-price objectives can be targeted through including particular conditions in the licence to be auctioned<sup>12</sup>. Auctions can also be highly transparent and maximise revenue for the government given the number of licences being assigned. As with administrative approaches, outcomes in practice from auctions may not always be efficient, particularly where poor auction rules lead to coordination

between bidders. However, the deficiencies of auctions can generally be remedied by attention to auction design whereas the problems of administrative discretion may be less easily dealt with. In summary, licensing authorities should determine the approach or combination of approaches to assigning licences, taking into account their particular objectives as well as the likely advantages and disadvantages of the different approaches in the particular market context, drawing on both theory and practical experience. Particular criteria to take into account are:

- how best to ensure that the licences are assigned to the most valuable use for society;
- ensuring the Government receives a fair return on spectrum without risking charges that are so high that valuable spectrum is left idle;
- the cost effectiveness and transparency of the differing assignment approaches; and
- competitive neutrality across technologies and players.

Whether an administrative or market-based approach is adopted, importance should also be attached to the detailed design of the approach. Key issues include: (i) ensuring a transparent process with sufficient time and information being provided to maximise participation; (ii) determining which operators should be eligible to apply/bid and whether the design should treat incumbent operators and new entrants equally; (iii) how to determine the price in a beauty contest or the reserve price for an auction; (iv) what non-price objectives should be targeted either in the beauty contest criteria or in licence conditions; (v) what rules should govern participants particularly to prevent coordination; and (vi) what auction design or information disclosure would best support an efficient outcome. Public consultation on the design of the licensing approach can help in ensuring that all key issues are taken into account.

Next, we turn to the issue of what process should apply when current licences expire, i.e., should the licences be renewed or alternatively reassigned between operators. First, we examine administrative approaches to licence renewal and then consider the case for re-auctioning the licence.

12. We discuss whether such conditions are sensible in Section 5.

### 3.2 Administrative approaches to licence renewal

Countries have employed a variety of approaches and criteria to determine whether existing mobile licences should be renewed or whether the licence should be re-allocated between operators. In this section, we assess the criteria that have been used under administrative approaches to determine whether licences should be renewed or alternatively reassigned.

#### A presumption of licence renewal?

A number of countries have established a presumption or high expectation of renewal in relation to spectrum licences – indeed this characterises most countries that have already considered the renewal of GSM licences. In particular, licensees are allowed to renew their licences except under certain defined circumstances which are expected to arise relatively rarely.

A presumption of renewal can make sense where the service, such as mobile communications, clearly represents the best use of a particular spectrum band and where the ongoing continuity of communications is important given the particular service's role as part of the economy's key infrastructure. A presumption of renewal also gives operators greater certainty and encourages them to bid for licences and invest in network development and the deployment of new services knowing that after the initial licence period it is highly likely that the licences will be renewed with little risk of losing the investment. This can be critical for investments that have long payback times such as mobile networks. A presumption of renewal can also improve operators' abilities to raise capital from financial markets.

If operators were instead given no confidence over renewal, they would be expected to undertake only shorter and shorter term investments as the year of expiry of their licences approaches and avoid undertaking any longer term investments – an operator may face large losses if sunk assets need to be written off because its licence is not renewed. This could mean that consumers in that country go without a major network upgrade for years compared with consumers in other countries. A failure to allow an operator to renew its licence can also cause harm to customers through service disruption with the potential that coverage in some areas is lost and/or handsets purchased by consumers no longer work. Service disruption may be prolonged given the timeframe for a new entrant to establish its network.

While recognising the major benefits of providing security of tenure for certain spectrum licensees, it is useful to examine circumstances under which particular countries provide for licensees not to be renewed. Indeed, a presumption of renewal will only provide a high degree of business certainty where the conditions under which licences will not be renewed are clear. We now turn to examine several provisions by which renewal may not be allowed in particular countries.

### Spectrum replanning

Many countries provide for licences to not be renewed where continuing the current use of the spectrum would be incompatible with the planned use of spectrum. The impetus for a change in use of the spectrum may arise from international radiofrequency planning and co-ordination or from national decisions. Such a provision can be an important means to enable new technology platforms to be introduced particularly where spectrum management continues to be centrally planned. Spectrum may also be replanned where the spectrum is required for national security or other purposes.

While spectrum replanning may be necessary to support efficient use of the spectrum on an ongoing basis, it is important that the benefits of different uses are carefully assessed and that where a change in use is contemplated, the cost of migrating or terminating the current use is taken into account. Further, spectrum plans should be announced as early as possible to give existing users sufficient notice. Forward reviews could be linked with the ITU's World Radiocommunications Conferences held approximately every three years. Finally, the need for regulatory-imposed spectrum replanning can be reduced by providing existing licensees with greater flexibility over the services for which the spectrum is used – we return to this in Sections 6 and 7.



### Breach of licence conditions

A breach of a licence condition is also commonly included as a reason for not renewing a licence. Where the licence conditions are made clear at the time of the initial assignment of the licence, then not renewing the licence or, indeed, revoking the licence before its expiry may be seen to be a proportionate response to a breach of a condition. For instance, revocation of the licence may be necessary if the licensee continually breaches the licensee's technical conditions causing intolerable interference to users of neighbouring spectrum. Given the serious consequences to consumers and to investment, denial of renewal should be considered as a last resort, after having been through a series of sanctions, fines and alternative remedial measures.

It is the case that occasionally licence conditions prove to be infeasible to meet such as where there are delays in equipment for new technology or because the economics of the business have fundamentally changed. This may call for some flexibility on the part of the regulator, albeit that too much flexibility may invite disputes where other operators who have made more progress towards meeting licence conditions or where bidders who were unsuccessful in acquiring a licence believe the later relaxation of conditions discriminates against them. In many cases, less severe measures than revoking the licence may be more proportionate. For instance, in Norway, one operator received a fine for not meeting its 3G coverage requirements based on the expected savings to the operator from not completing its coverage<sup>13</sup>. Many of the issues associated with failures to meet licence conditions can generally be avoided by keeping ongoing licence conditions to the minimum necessary to ensure efficient spectrum use, i.e., essentially what is necessary to manage interference (we discuss this further in Section 5).

### Promoting competition

Another reason that has been used by some regulators for not renewing spectrum licences is where ending a licensee's current use of spectrum is used as a means of promoting competition. For instance, the Australian Government sought to encourage the entry of new GSM operators in the early 1990s by undertaking to close the incumbent analogue AMPS network in 2000 and thereby putting all players on an equal footing. A key issue in the consideration of whether 2G spectrum should be allowed to be reformed for use in supplying 3G services is whether some existing licensees should be required to give up some of their spectrum so that the lower frequency spectrum is more evenly distributed among all the mobile operators in the particular market<sup>14</sup>. Singapore's regulator, the IDA, has proposed that the existing 2G operators in Singapore should be given no preference in relation to future rights to the "2G spectrum" so as to provide an opportunity for new entrants to acquire the spectrum rights and to avoid "perpetuating legacy imbalances"<sup>15</sup>.

As discussed above, the risk that an operator may lose its right to spectrum can act as a serious deterrent to investment. Accordingly, any provision that would result in a licence not being renewed needs to be carefully circumscribed. The following three tests can help limit the use of a competition rationale to only those cases where it is likely to generate overall benefits:

- **First, a decision to not renew a licence so as to promote competition only makes sense where competition in the market has already been assessed as not being effective. In this regard, the evidence suggests that the presence of a relatively small number of mobile operators may be sufficient to ensure competitive outcomes. For instance, of the 20 EU national regulators that had assessed the competitiveness of their national markets for mobile access and outgoing calls as at 26 July 2007, 15 had found the markets to be effectively competitive with the only markets not to be found to be competitive being those containing 2 operators and some of the markets with 3 operators.<sup>16</sup>**
- **Second, it may be possible to ensure competitive outcomes by making available other spectrum that does not require an existing operator to give up their spectrum. For instance, the transition to digital broadcasting should free up substantial spectrum currently used for analogue broadcasting services (the so called "Digital Dividend").**
- **Finally, even where it was anticipated that re-assigning spectrum could result in a competition benefit and that benefit was not achievable by other means, a judgement would need to be made that the magnitude of the competition benefit would outweigh the potential harm to investment.**

These considerations suggest that spectrum re-assignment for the purposes of promoting competition is likely to be make sense only in exceptional cases where there is currently very limited competition in the market and where a re-assignment would not substantially undermine investment incentives (e.g., if it were limited to only a part of the existing licensee's bandwidth). Where spectrum is to be re-assigned, licensing authorities should provide a sufficiently long notice period to facilitate alternative planning and migration of customers.

13. Bird & Bird, "Crunch time in the roll-out of UMTS in Swedish electronic communications markets", 16 February 2005.

14. For instance, the French regulator, ARCEP, is proposing to re-assign current 2G spectrum to achieve a more even distribution as part of allowing the spectrum to be reformed for 3G use (ARCEP press release, 26 November 2006). This issue is discussed further in Section 6.

15. IDA, Proposed Framework for the Reallocation of Spectrum in the 900 MHz And 1800 MHz Frequency Bands, 28 June 2007.

16. European Commission, Article 7 Competition/ Regulation First Round Overview Table, 26 July 2007.

### Poor use of the spectrum

A licence may also not be renewed where the existing licence holder is considered not to be making the best use of the spectrum. Such a provision is often put forward as a means by which to guard against valuable spectrum being left idle or underutilised. In Hong Kong, the regulator decided to not give a right of first refusal to the CDMA and TDMA licensees at the time of renewal because it considered that they had neither actively developed their networks nor actively marketed their services. In Bangladesh, despite limited spectrum being available for mobile operators, certain spectrum that could be used for GSM was being left idle because it had been allocated to wireless local loop operators that had not established businesses. Bangladesh's regulator has subsequently cancelled some of the wireless local loop operators licences<sup>17</sup>. In the US, licensees are required to demonstrate that they are providing "substantial service" as a pre-condition for licence renewal.

While such provisions are reasonable in principle, there is a significant risk of error where a regulator seeks to assess whether spectrum is being poorly used. For instance, there may be sound economic reasons as to why spectrum is left idle for a period such as when new technology or equipment is expected to become available shortly. In that regard, a regulatory requirement to demonstrate substantial service may encourage operators to behave inefficiently such as by undertaking investments prematurely so as to avoid losing the spectrum<sup>18</sup>. There is also a more general danger arising from such provisions in that they risk greatly increasing business uncertainty and undermining the incentive to undertake long-term investments.

The FCC in the US has argued that the concept of "substantial service" provides licensees with the flexibility to determine how best to use their service rather than having the regulator mandate particular benchmarks to be met. The FCC does set out 'safe harbour' benchmarks, such as a particular level of coverage, that while not mandatory for licence renewal, would meet the "substantial service" requirement for renewal. However, given the value generally placed on licence renewal, licensees tend to focus on the 'safe harbour' benchmarks rather than risking alternative service delivery<sup>19</sup>. Thus, the use of specific benchmarks (which limit licensees' flexibility to use spectrum in its most valuable use) or vague concepts such as "substantial service" (which creates business uncertainty that risks deterring investment) can carry significant problems.

Alternative approaches that seek to introduce market-based incentives are likely to prove a superior way of ensuring efficient spectrum use. As we discuss in later sections of this report, such approaches include efficient pricing of spectrum, potential re-auctioning as well as more substantial reforms to allow for spectrum trading and liberalisation. Given the availability of these other approaches, it is questionable whether a regulatory-determined view that spectrum is being poorly used should be adopted as a reason for not renewing spectrum licences.

### 3.3 Re-auctioning of spectrum

One market-based approach to spectrum renewal is assigning future spectrum rights on the basis of an auction. Re-auctioning represents a more robust approach than an administrative judgement of assessing whether the current licensee will make the best use of the spectrum or whether other operators could make better use of the spectrum. The operator that can use the spectrum to generate the most value would be expected to outbid other operators. As such, the regulator would not be called upon to make an assessment of whether a particular operator is using the spectrum as well as they can given technical and market factors.

The re-auctioning of spectrum was proposed in Norway, although only the existing licensee applied so that they were awarded the spectrum without the need for an auction (see Box 2). The New Zealand Government announced in April 2007 that it plans to re-auction some of the spectrum in the 800MHz and 900MHz bands currently held by the two mobile operators when those licences expire in 2011 and 2012<sup>20</sup>. The decision was taken after a review suggested that some of the spectrum was currently underutilised. The Government decided against re-auctioning all the incumbents' spectrum noting that it would increase the risk of stranding investment and would risk undue disruption of services in the transition from one period to another. The Government will allow the major operators to sell directly to new entrants rather than face a later re-auction. The incumbent operators would also be allowed to bid for the spectrum if there is a later auction.

Re-auctioning can be viewed as creating a level playing field by requiring existing licensees to bid for the spectrum in competition with any new entrants. Further, assigning a spectrum licence on the basis of bids in an auction represents a more transparent allocation mechanism than regulatory judgements as to which operator is likely to better meet particular objectives.

#### Box 2 – Licence renewal in Norway

Norway was one of the first European countries to renew GSM licences. The 900MHz licences of the two major Norwegian mobile operators were due to expire on 31 October 2005. The operators requested that their licences be extended two years prior to the expiry date. The Ministry of Transport and Communications, with responsibility for determining whether the licences should be extended, conducted a consultation during April and May 2004, seeking views on whether the licences should be extended as well as on various technical matters.

The Ministry then made an offer in November 2004 to the existing operators to renew their licences for 12 years for an upfront payment of NOK100 million, annual payments of NOK9.6 million and with somewhat changed licence conditions and on the condition no other party registered an interest in the frequencies by 22 April 2005. The level of the upfront payment was determined on the basis of a range of fees determined in 2G and 3G auctions across Europe.

Thus, the existing operators were required to decide whether to accept the Ministry's offer with the knowledge that any other party would face a similar minimum upfront payment of NOK100 million. If either of the existing operators had rejected the Ministry's offer, this would have triggered an auction – however, both operators accepted the offer. Other parties were then invited in February 2005 to register their interest for an auction with the requirement to supply a bank guarantee for the NOK100 million reserve price so as to deter speculative applications. No other parties registered an interest in the licences so that the operators' licences were renewed without the need for an auction.

The Norwegian process represents a means of providing the opportunity for new entrants to bid for existing licences through first registering their interest without incurring the cost of actually designing and running an auction if no other parties believe that they would outbid the incumbent operators. One drawback of the Norwegian approach (compared with an automatic renewal) is that if other parties had registered their interest, then the investment programmes of the existing operators may have been suspended until the outcome of the auction was known.

20. Press release of the Communications Minister, "Cellular rights renewal gives greater certainty", 12 April 2007.

There is a reason, however, to be sceptical about the value of re-auctioning spectrum in many cases. Incumbent operators with networks and customer equipment already tailored for the particular spectrum band have already incurred substantial costs that are sunk in the sense that only a proportion of the total costs may be recoverable if they are unsuccessful in retaining their licence. As such, incumbent operators will bid for the spectrum on the basis of the expected profitability of the services excluding the sunk costs, i.e., the sunk costs have already been borne regardless of whether the operator retains its licence. In contrast, a new entrant would need to factor in all its costs in establishing its business were it to win the licence. Thus, in many cases incumbent operators would be expected to win an auction.

A report summarising European experience on GSM licence renewal for the Dutch Ministry of Economic Affairs has noted that “So far there has been little or no interest from potential new entrants in acquiring spectrum for use for GSM, and any provisions in the law or licences which allow a prolongation, tend to be followed, even if other options (e.g., reissuing the licences) are permitted”.<sup>21</sup>

If an auction is expected to result in the incumbent operators winning the spectrum, it is questionable whether the costs and uncertainty created would be justified. Auctions can generate significant administrative costs and there is a risk that poor auction design will lead to inefficient outcomes. There may also be significant uncertainty leading up to an auction which could deter investment particularly if the auction is held towards the end of the term of the licence. An indication of the uncertainties that could result can be gained by considering the consequences that would flow from the Government only allowing land to be leased from the Government with periodic reviews to determine whether existing holders of property rights should be allowed to continue to have the right to use that property. The consequence would be little long-term investment in maintaining buildings.

The Norwegian approach, set out in Box 2, of first requiring potential bidders to register (including providing bank guarantees for the reserve price), is a means of providing an opportunity for new entrants to compete for spectrum while avoiding unnecessary costs should no other player believe that they would attach greater value to the licences than the incumbent operators. The New Zealand approach of only auctioning some of the spectrum represents a compromise where it was considered appropriate to provide access to some of the relevant spectrum to the smaller operators while recognising the incumbent operators’ substantial investments and the desirability of continuity in service.

In Section 7 of the report, we consider how in the longer term the introduction of trading (i.e., the ability to buy and sell spectrum rights) and spectrum liberalisation (i.e., rights to change in the use of spectrum) can ensure that spectrum is used efficiently without the need for periodic interventions by the regulator either in the form of administrative judgements or in re-auctioning of spectrum.

### 3.4 Recommendations

Following are our key recommendations in relation to the assignment of licences and the approach to licence renewal.

**Recommendation 6** – There should be a presumption in favour of licence renewal for mobile licences to encourage long-term investment and minimise the risk of service disruption to customers. Reasons for not renewing licences should be limited to spectrum replanning or where there has been a serious breach of licence conditions. Exceptionally, a licence may not be renewed in relation to the whole or part of the relevant spectrum so as to promote competition. However, before not renewing a licence for this reason, regulators should first (i) assess whether competition is already effective in the market; (ii) identify whether competition can be promoted by other means such as the release of alternative spectrum; and (iii) assess whether the expected competition benefits will exceed the potential costs such as in relation to customer migration and the risk of deterring investment.

**Recommendation 7** – Re-auctioning spectrum at the end of the licence should be limited to situations in which there is a reasonable prospect that spectrum will be re-assigned between operators (or where additional spectrum is being made available). In most cases, the existing operators would be expected to re-acquire the licence with the consequence that an auction only creates unnecessary uncertainty and costs.

**Recommendation 8** – There should be a presumption in favour of licence renewal for mobile licences to encourage long-term investment and minimise the risk of service disruption to customers. Reasons for not renewing licences should be limited to spectrum replanning or where there has been a serious breach of licence conditions. Exceptionally, a licence may not be renewed in relation to the whole or part of the relevant spectrum so as to promote competition. However, before not renewing a licence for this reason, regulators should first (i) assess whether competition is already effective in the market; (ii) identify whether competition can be promoted by other means such as the release of alternative spectrum; and (iii) assess whether the expected competition benefits will exceed the potential costs such as in relation to customer migration and the risk of deterring investment.

**Recommendation 9** – Re-auctioning spectrum at the end of the licence should be limited to situations in which there is a reasonable prospect that spectrum will be re-assigned between operators (or where additional spectrum is being made available). In most cases, the existing operators would be expected to re-acquire the licence with the consequence that an auction only creates unnecessary uncertainty and costs.

21. Analysys. A study of the considerations and circumstances of GSM licence renewals in EU countries, 2 September 2005. Further, even in relation to 3G auctions which were associated with substantial more uncertainty than would accompany the re-auctioning of a GSM licence, incumbent 2G operators secured 3G licences in virtually all EU countries in which auctions were held.

# 4

## Pricing of mobile licences

A wide variety of approaches have been adopted for determining the fees to be charged in relation to mobile licences. In this section, we first evaluate different pricing objectives and then examine the various pricing approaches against a range of criteria.



## 4.1 Objectives

Licence fees can be set for three main purposes:

- (i) to recover the administrative cost of the licensing process itself, of administrative management of spectrum and associated regulatory costs;
- (ii) to encourage efficient spectrum use such as where the level of the licence fee is determined in an auction or where it is set at the level estimated to be in line with the market value of the licence; and/or
- (iii) to raise revenue for the government.

The first objective of setting the licence fee to recover the cost of the licensing process is particularly common in relation to operating licences and for spectrum licences where there is no excess demand for a particular spectrum band. We discuss this pricing approach further in the next section.

Where there is excess demand for spectrum, the level of licence fees may serve an additional purpose of helping to assign scarce spectrum resources efficiently, i.e., so that spectrum is assigned to the user that is able to generate the greatest value to society from its use. Auctions can be expected to function in this way. Alternatively, even where spectrum rights are assigned using an administrative process, setting the licence fee in line with the opportunity cost of the spectrum<sup>22</sup> can promote efficient spectrum use. For spectrum that has previously been assigned, charges set in line with the opportunity cost of spectrum may also facilitate efficient spectrum use if that spectrum is not already assigned to its highest value use. Where the spectrum is already in its highest value use then raising the licence fee would bring no efficiency benefit and may even harm efficiency if the level is set too high so that valuable spectrum is left idle. As we discuss in Section 7, where spectrum trading is effective then the market can be expected to result in spectrum being assigned to the user who can generate the most value from the use of the spectrum without any need for a licence fee to be set to achieve efficient spectrum use.

A third potential objective of setting a licence fee is to raise revenue for the government. It is reasonable for governments to seek to earn a fair return on selling rights to use public resources such as spectrum and such a return may be achieved either from an upfront licence payment or from ongoing taxes and charges. However, there is the need to ensure that the licence fees are not set so high as to harm investment and the efficient development of the sector. High upfront licence fees can deter new entry and

lead to debt levels which increase the cost of raising funds for investment in network and service deployment. High ongoing charges flow through into high mobile prices which can retard growth in the number of subscribers and limit call volumes and ultimately high overall economic growth. A number of studies have found that reductions in mobile specific taxes can have a significant positive impact on subscriber numbers and overall economic growth. The faster growth of the sector, in turn, acts to limit any loss in government revenues – indeed, in certain cases, overall government revenues may even increase from lower rates of tax on the mobile sector. The studies' finding that lower mobile specific taxes and charges may boost overall economic growth<sup>23</sup> is in line with general taxation theory that it is more efficient to raise revenue from as wide a base as possible.

In short, there is a strong economic case to avoid the level of licence fees being determined on the basis of revenue maximising objectives. Rather licence fees should be limited to recover the administrative costs of the licensing process and, in some circumstances, set higher to encourage efficient spectrum use (i.e., where efficient spectrum use would not otherwise be achieved).

22. The opportunity cost of spectrum is the value of the spectrum in the best alternative use which is the highest price that would be offered by a rival bidder at auction. In Section 4.2, we discuss a number of approaches to determining the opportunity cost of spectrum. Note that where there is no excess demand for a particular spectrum band, then the opportunity cost of that spectrum band falls to zero.

23. For instance, see Deloitte, Global mobile tax review 2006-2007.

## 4.2 Pricing approaches

We now turn to examine particular pricing approaches that have been applied in practice.

### Setting fees to recover administrative costs of licensing

Licence fees in a number of countries are set to recover the administrative costs of the licensing process and regulatory costs associated with the licensed activity. This pricing approach is in line with a user-pays principle (i.e., that telecommunications users should ultimately bear the cost of licensing activity incurred to support the provision of the particular services).

The European Union's Authorisation Directive (Art. 12) provides for EU Member States to levy administrative charges but requires that the total amount of the charges should not exceed the administrative costs incurred in relation to management, control and enforcement of the licensing scheme and in relation to associated regulatory activities. The Directive also requires that the charges be imposed in an "objective, transparent and proportionate manner which minimises additional administrative costs and attendant charges".

It is important that the licensing authority faces external control to ensure that costs are kept at efficient levels and in that regard the funding arrangement should also be relatively simple and practical. Further, the licence fee should be collected across the industry in a competitively neutral manner and avoid creating incentives for firms to restructure their activities so as to reduce their liability for the charge. The European Union's Authorisation Directive (Art. 13) also provides for fees to be levied, where objectively justified, for the rights to use radio frequencies which reflect the need to ensure the optimal use of these resources. We next consider how such charges might be determined.

### Auctioning or re-auctioning of spectrum

Auctioning of spectrum provides the most direct way of determining the market or efficient price for spectrum. However, for the reasons discussed in Section 3.3, auctions can create significant uncertainty and potential deter investment in network development and new service deployment in the years leading up to the auction. This risk, together with the administrative costs of designing the auction, may appear excessive if there is a high probability that the existing licensee will win the auction. Further, if there is the expectation that the existing licensee will win, then new entrants may decide not to participate in an auction with the consequence that the auction fails to reveal the actual opportunity cost of the spectrum.

Given these considerations, indirect ways of estimating the market price of spectrum are likely to be preferable to an auction in many cases. Nonetheless, maintaining the option for existing licensees to decline to pay the regulatory-determined price and instead to re-bid for the spectrum rights at auction can provide a safeguard against the regulatory-determined price being set too high with the risk that valuable spectrum is left idle.

### Marginal forward-looking opportunity cost (MFLOC)

The MFLOC approach is based on estimating the change in costs that would result for an operator, operating an optimal network, to maintain the same quantity and quality of services to customers if it were to gain or lose an increment of spectrum. The rationale of a MFLOC approach is to promote efficient spectrum use by encouraging holders of spectrum licences to return their licences whenever the value they place on the licence is less than the price charged.

The choice of the optimal network is akin to a forward-looking cost approach of using the costs that would be incurred by a new entrant using the least cost modern equivalent assets for supplying the services. Estimating the MFLOC can be useful for spectrum that is not sold at auction or that is not tradable. Charges based on MFLOC may be particularly relevant to public sector users of spectrum who may not face incentives to maximise the value from their use of spectrum with the risk that spectrum assigned to them is poorly utilised.

The New Zealand Government has recently decided to apply a form of MFLOC pricing (which they label incremental Optimised Deprivation Value) for the renewal of the New Zealand mobile operators' spectrum licences.<sup>24</sup> A MFLOC approach is also used in the UK to calculate annual Administrative Incentive Prices for 2G spectrum that was not sold at auction.<sup>25</sup> Ofcom has, however, rejected the application of a MFLOC approach to 3G spectrum given the complexity of doing so.<sup>26</sup> In particular, Ofcom notes that the smallest practical change in 3G holdings (at 2x5MHz) would need to be larger than the smallest change in 2G spectrum and this would require changes in output as well as changes in costs to be modelled. Discounted cash flow modelling of revenues and costs would be likely to be required (see below). The market uncertainty surrounding 3G services also suggests such modelling would be unlikely to determine a precise number with any degree of confidence.

Calculating the MFLOC directly can be complex and contentious. A risk of an MFLOC charge being calculated incorrectly too high is that efficient spectrum use may be undermined. Further, if the charges are imposed where they do not affect the use of spectrum (i.e., where spectrum is already in its best use), the charges will simply represent a transfer of income from customers of the services using the spectrum to the Government rather than promoting efficiency. We turn next to consider indexation and benchmarking which may be more practical means to estimate the opportunity cost in particular circumstances.

24. New Zealand Minister of Communications, Arrangements for the renewal of radio spectrum management rights used for cellular services, 4 April 2007, para. 46. See also the discussion paper from the Ministry of Economic Development, Renewal of Management Rights for Cellular Services, July 2006.  
25. Ofcom, Spectrum pricing statement, 23 February 2005.  
26. See Ofcom, Mobile call termination statement, 27 March 2007, para. A14.25.

### Indexation of historical fees

An alternative way of arriving at an estimate of the current market price for spectrum is to take the original price (particularly if it has been determined at an auction) and adjust this price by an estimate of how much the forward-looking value of the spectrum has changed over time. For instance, the New Zealand Government has applied this approach to the renewal of AM and FM radio licences based on adjusting the original auction prices for the spectrum by a growth factor estimated to reflect the change in value of the spectrum up to the time of reallocation (in practice, the value may have increased or fallen over time). The change in value was estimated based on comparing net cash flows from the current period with expected net cash flows over the period of the renewed licences taking into account revenue drivers. The Government's own advisors rejected the use of an indexation approach for mobile services in New Zealand given the significant technological and commercial changes impacting the mobile market since the time that the initial licences were issued. However, this approach could be considered for licences where the historical price was more recently determined and where the development of market values over time is less uncertain.

### Benchmarking

Another way to estimate the market price for a particular band of spectrum is to use benchmarks based on recent prices determined in auctions or in secondary trading of spectrum either for similar spectrum in the same country or in other countries. A benchmark will provide a reasonable estimate provided that:

- the chosen benchmark is for spectrum that can be expected to have a similar market value to the particular band given the demand and cost factors impacting on the use of the spectrum; or
- where robust adjustments can be made to the chosen benchmark to account for any differences in demand and cost factors.

Relevant demand and cost factors that would need to be controlled for include population and population density, GDP per capita, the type of spectrum, licence duration, licence conditions and expected future releases of spectrum in the market. In Pakistan, prices for the renewal of licences for the existing mobile operators were determined on the basis of prices paid at auction for licences provided to 2 new entrants (see Box 3). Pakistan's Government was able to draw on the results of a recent auction for similar spectrum. Where a comparable price exists then benchmarking may be a practical means to estimate the fee for a new licence. Benchmarking may also be useful as a cross-check on the reasonableness of other approaches.

### Box 3 – Licence renewal in Pakistan

Pakistan's Government considered the issue of licence renewal as part of its new policy for the mobile industry developed in line with its overall deregulation policy for the telecom sector adopted on 10 January 2004.<sup>27</sup> Among other matters, the policy provided for the auctioning of spectrum for two new mobile entrants. A range of obligations were attached to new licences including in relation to quality of service, coverage and consumer protection. The licences were issued for 15 years (renewal upon application) and also included a range of benefits including rights to build regional backbones, future rights in respect to bidding for additional 3G spectrum and the ability to apply for funding from the Universal Access Fund.

The Government provided existing licence holders with the ability to come under the same licence terms as the new entrants as soon as possible or, at the latest, upon the expiry of the licences. The licences of the existing operators were due to expire in 2005 (Instaphone and Paktel), 2007 (Mobilink) and 2013 (Ufone). The existing operators were, however, required to pay for the renewal of their licences a fee so that the price per annum per MHz was the same as that determined in the auction for the new licences.

In April, the auction for the two new GSM licences was won by Telenor and Warid Telecom who each paid \$291 million. The requirement to pay a similar amount upon licence renewal was initially challenged by the existing operators. However, after negotiations with the regulator Paktel, Instaphone and Mobilink agreed to pay the equivalent amount to the new entrants but with a significantly more relaxed installment plan, and with the AMPS-operator Paktel being allowed to migrate to GSM. The Government has subsequently deferred the annual installments payable by two of the operators until May 2009 and has had difficulty enforcing even the relaxed payment terms on another operator.

Pakistan's approach of linking the price for licence renewal to the prices paid at auction by new entrants should have provided a good estimate of the market price for the spectrum rights being renewed. The extent to which the fees ultimately paid by the established operators (in present value terms) varies from the price paid by the new entrants will clearly represent a departure from the efficient price. Moreover, competition and competitive entry in the long run may be harmed in countries where the Government is seen to favour incumbent operators relative to new entrants.

### Discounted Cash Flow (DCF) modelling

DCF modelling seeks to value spectrum on the basis of the present value of the future cash flows that the use of the spectrum is expected to generate. In particular, the modelling estimates the discounted present value of expected future revenues from the output produced by the asset, less the present value of associated future operating costs and taking into account any potential future re-sale value for the spectrum rights. An investor would be expected to be prepared to pay a price for the spectrum up to the value at which it can no longer make a commercial return on the investment given the expected future cash flows.

DCF modelling would be problematic if it were used to seek to capture all the economic profits of an operator that has already incurred significant sunk costs in building its network.<sup>28</sup> This is because it is the opportunity to earn such profits that provides the incentive for such investment. DCF modelling can also be highly complex and contentious, particularly as uncertain forecasts of future demand can have a significant impact on the valuation. Accordingly, there may be a large margin for error in relation to DCF modelling, particularly given the information available to the regulator.

An alternative approach of establishing the value of spectrum would be to seek to disaggregate the market capitalisation of a listed operator so as to identify the value attributed to the spectrum rights. However, it is unlikely that this approach can be applied robustly in most cases.

<sup>27</sup> The policy towards the mobile industry is set out in the Ministry of Information Technology's document, Mobile cellular policy, of 28 January 2004.

<sup>28</sup> DCF modelling could instead be used to estimate the MFLOC of spectrum by valuing the spectrum to an operator at the margin. As such, it would have the efficiency properties in principle described above under the MFLOC section as well as the difficulties of estimation in practice.

### Annual versus upfront licence fees

In addition to determining the amount of licence fees to be recovered, there is also a question of the structure of the fees, particularly in relation to whether the full amount should be recovered upfront, by annual charges or by a combination of the two.

Recovering licence fees through an upfront payment may help ensure that spectrum is allocated to only serious operators. Upfront fees also imply that, once the fees have been paid, they will not affect the pricing of services as operators will set their prices to maximise their profits given the competition in the market regardless of what they have paid previously.

Annual charges, on the other hand, may encourage new entry, particularly where entrants would have difficulty raising a large upfront payment and where the risk of entry is reduced by being able to return the licence if their business does not succeed. Royalties, i.e., annual charges levied as a percentage of revenues, can further reduce the risk to new entrants as their payment to the Government will be relatively small while their revenues are small. However, precisely because royalties imply a relatively small payment for operators that are making little use of its spectrum, royalties may undermine efficient spectrum use - indeed some licensees may choose to hold off making any network investment. Further, the actual royalty rate in practice tends to be highly political and contentious.

Annual charges carry a further problem in that they will tend to be factored into service prices. This is particularly the case where the level of charges varies with service volumes as occurs with royalties, i.e., where a charge is set as a percentage of revenues. As discussed above, earlier reports for the GSMA have found that mobile revenue taxes in some countries are so high that they are significantly inhibiting the growth of the mobile sector. Further, in markets in which competition is limited, royalties can also exacerbate the welfare loss arising from any excess pricing.

### 4.3 Comparative summary

Table 1 summarises the advantages and disadvantages of the different pricing options.

Table 1: Assessment of pricing options

Approach	Advantages	Disadvantages
Pricing to recover administrative costs of licensing process	Appropriate for operating licences and where spectrum is already in its best use or where there is no excess demand for spectrum	May not lead to efficient spectrum use where there is excess demand for spectrum
Re-auctioning	Accurate market value (subject to auction design and competition among bidders in the auction)	In the context of licence renewal, can create substantial uncertainty and significant administration costs
MFLOC	Can promote efficient spectrum use (subject to accuracy of estimate)	Difficult and contentious to model
Indexation of historical prices	Simple and transparent where changes in market values from historical prices can be estimated	Accuracy depends on the extent to which the change in market values over time can be estimated
Benchmarking	Simple and transparent where close benchmarks exist	Can be misleading if no close benchmarks exist because of differences in the nature of spectrum bands or differences between markets
DCF modelling	Can be accurate in principle	Requires detailed modelling and may be highly inaccurate given uncertainty over forecasts. Assumptions may prove contentious. DCF modelling would carry a large risk of deterring investment if it were used to seek to capture all the economic profit from acquiring a licence
Royalties	Reduces risk for licensees compared with upfront charges and encourages new entry	Royalties act to increase service prices. Royalties can also undermine efficient spectrum use as operators with low revenues make only small payments

### 4.4 Recommendations

Following is our key recommendation in relation to licence fees.

**Recommendation 8** – Licence fees should generally be limited to recovering the administrative costs of the licensing process and associated regulatory costs. However, where there is excess demand for spectrum, then an auction or administrative assignment of spectrum with a charge set in line with the Marginal Forward Looking Opportunity Cost (MFLOC) of spectrum should be considered. Indexation or benchmarking may prove a practical means to estimate MFLOC in particular circumstances. The MFLOC should be estimated conservatively to reduce the risk that valuable spectrum will be left idle. The relative merits of upfront licence versus annual charges should be considered with regard to the particular market circumstances.

27. The policy towards the mobile industry is set out in the Ministry of Information Technology's document, Mobile cellular policy, of 28 January 2004.

28. DCF modelling could instead be used to estimate the MFLOC of spectrum by valuing the spectrum to an operator at the margin. As such, it would have the efficiency properties in principle described above under the MFLOC section as well as the difficulties of estimation in practice



# 5

## Reviewing non-price terms and conditions

Licences can contain a range of obligations and conditions which go beyond authorising access to the market and/or the use of spectrum for a period of time upon the payment of a licence fee. The purpose of the section is to assist licensing authorities in reviewing particular non-price terms and conditions at the time of the initial licensing of operators and when licences are being considered for renewal.



## 5.1 Licence duration

An integral part of a licence is its duration. In many countries, licences of as short as one year are issued with operators forced to make investment decisions based on assumptions as to how long their licence will continued to be renewed. The uncertainty created can be a significant deterrent to investment, distort investment decisions and increase operators' cost of funds.

The longer the duration of a licence, the more attractive it will be for the licensee to undertake long-term investments in developing and upgrading its network. Investors will be reluctant to undertake investments if the licence runs for a shorter period, than the expected payback period and if there is uncertainty over whether the licence will be renewed again in the future. Depending on the type of investment and the nature of the market, some communications industry investments may take over 15 years to recover the cost of that investment, such as where operators are expected to re-use a current "2G band" for 3G or other advanced services. A shorter timeframe may be more relevant upon the renewal of a licence for other spectrum if there is expected to be less significant ongoing investment. A further consideration is to set the timeframe so as to align the expiry dates for licences for similar spectrum. This can help ensure that similar licences are subject to the same terms and conditions going forward.

In the longer term, as licences become more service and technology neutral and where trading in spectrum rights is permitted, longer duration licences are likely to make more sense as the greater flexibility can help ensure spectrum is used efficiently on an ongoing basis while the longer duration provides for greater investment certainty.<sup>29</sup> However, introducing greater flexibility in spectrum management raises a number of implementation issues which we discuss further in Section 7.

## 5.2 Obligations in relation to specific policy objectives

Regulators often impose additional obligations on licensees which are aimed at achieving particular policy objectives and that are not integral to the purpose of the licence. These can include obligations relating to universal access, such as coverage and service commitments as well as obligations relating to the promotion of competition. Where a licence is assigned using a beauty contest, rather than an auction, commitments to meet non-price criteria can come to dominate the assignment process.

By way of general comment, we note that when only one incumbent operator was being licensed, then imposing a series of obligations as part of that operator's licence represented a relatively straight-forward way to achieve particular objectives. However, the development of competition in telecommunications markets raises the need to review relatively regularly which policy objectives remain relevant and whether obligations should be imposed on all operators or only on particular operators. In this context, more flexible and targeted regulatory measures may prove to be more effective and efficient than seeking to achieve the objectives through licence conditions.

Reflecting such considerations, there is a regulatory trend against seeking to achieve universal access and competition objectives through licence obligations. The UK Government's independent review of spectrum management recommended that:

"The RA [RadioCommunications Authority] should aim to minimise the licence conditions to those necessary for efficient spectrum use. Existing licences should be amended to remove restrictions which are not needed for reasons of international co-ordination or interference management, and new licences should be issued with the minimum number of restrictions possible."<sup>30</sup>

We explore these issues further in relation to the specific areas of coverage and service obligations as well as obligations to promote competition.

### Coverage and service obligations

Many regulators have imposed licence obligations on mobile operators to provide a particular level of service coverage within a specified timeframe. A number of regulators have also included additional requirements to offer particular services or a particular quality of service as well as measures relating to universal access and consumer protection goals.

In deciding whether to impose such obligations, licensing authorities should consider:

- (i) the benefits and costs of such obligations; and
- (ii) whether there are less costly means to achieve the objectives.

Achieving high levels of access to telecommunications services is a common objective of many governments. Whether a particular regulatory obligation is required to support universal access goals will, however, depend on the particular market circumstances. In many cases, competition in the mobile industry has resulted in the widespread availability of affordable mobile services with levels of coverage being a key means by which operators seek a competitive advantage over their rivals.

29. Indeed, the longer term move to the use of perpetual licences (without a fixed date of expiry) has been advocated by some academics as well as by the Australian Government's Productivity Commission (Australian Productivity Commission, Radiocommunications Inquiry Report, p. XLVI). Perpetual licences would remove the artificial assumption that spectrum may need to be re-assigned at a fixed time in the future. Such licences would need to be accompanied by measures to increase flexibility of use (such as trading and liberalisation) with governments retaining the ability to re-assign spectrum when and if a need arose either by purchasing the spectrum rights or, in exceptional cases, acquiring them compulsorily

30. Review of Radio Spectrum Management, March 2002, para. 7.2.

Licensing authorities should also be aware of the potential risks of imposing stringent coverage or service requirements. In particular, obligations may sometimes force operators to deploy networks and/or services faster than it is economically or commercially sensible to do so. For instance, this could arise where technology is still at an early stage with a number of technical flaws remaining or where equipment prices are relatively high before more widespread take-up of the equipment internationally.

Obligations may also force operators to incur losses (e.g., by deploying networks in advance of sufficient demand for the services) which can create particular difficulties for new entrants without established cash flows. Where operators fail to meet their licence conditions (as was the case with 3G licence conditions in a number of European countries including France, Spain and Sweden), regulators are confronted with the dilemma of whether to take the drastic step to revoke the licence with potential harm to competition or postpone or abandon the licence condition. Relaxation of licence conditions can lead to legal challenges by other operators who have met the conditions or by potential new entrants who may have bid for the licence if they had known the licence conditions would not be enforced.

As an alternative to imposing rigid coverage and service obligations, governments could also consider other measures to improve access to mobile phones including ensuring that spectrum is released to the market to the greatest extent possible, allowing for refarming and liberalisation so that the spectrum can be used efficiently (see Sections 6 and 7) and facilitating greater voluntary network sharing particularly in relation to parts of the network that do not constrain service differentiation and in rural areas. These measures help to change the underlying economics of extending coverage and thus may be more likely to be achieved, and achieved at lower cost, than seeking to enforce licence obligations.

If the aim is to achieve mobile coverage in some remote areas, then government funding for the provision of one network in those areas may be sufficient to achieve that aim without needing obligations to be imposed on all operators. In the first instance, it is likely to be desirable to consider steps to remove barriers to the commercial provision of services in rural and remote areas (such as releasing additional spectrum in lower frequency bands or permitting greater network sharing), although public procurement such as tenders for operators to apply for government funding to extend network coverage to areas where commercial provision is uneconomic may also be useful. In this regard, the Nigerian Communications Commission (NCC) has noted that:

“It is no longer fashionable to give rollout obligations to licensees. To spur the growth of rural service provision, regulators are rethinking their strategies and it has been found that reduced entry barriers, lower entry fees, infrastructure sharing and unhindered use of new wireless broadband technologies are more effective measures to promote cost-effective and rapid deployment of last-mile network technologies in rural and unserved areas...The Commission will not impose separate rollout obligations on unified licensees, but rather deal with universal access issues in a separate universal access regulation, in which universal access targets and respective designation mechanisms are defined.”<sup>31</sup>

#### Box 4 – Licence renewal in France

The French regulator, ARCEP, launched a preliminary consultation in July 2003 in relation to the renewal of the Orange and SFR ‘GSM’ licences which were due to expire in March 2006 (the licence of Bouygues Telecom expiring in December 2009). The consultation found that there was no interest in the spectrum from new entrants so ARCEP proceeded to determine the terms and conditions to apply to the major operators’ licences on renewal. ARCEP decided to impose a range of new obligations including: the extension of the population coverage from 90% in the initial licence and the inclusion in the renewed licence of the objectives of the agreement signed in 2003 between the government, local authorities, the regulator and mobile operators concerning areas (“white zones”) not currently served by any operator, so that coverage extends to 99% of the population of metropolitan France (that agreement provided for passive infrastructure such as towers to be financed by the government and local authorities in the first stage and subsequently financed by the 3 French operators); a requirement to provide packet data and location based services (intended to stimulate service innovation) and to provide a particular quality of data services; as well as conditions in line with the EU Authorisation Directive to improve accessibility of mobile services for people with disabilities, sharing of transmitter sites and measures to deter handset thefts.

The Government set a fee for the renewed licences of a fixed annual charge of €25 million and a variable annual part corresponding to 1 per cent on the GSM annual revenues of the licensees (this corresponds to the percentage licence tax on 3G with the intention to avoid inefficient arbitrage). The level of the fee was limited because of the operators’ financial obligations to meet the additional coverage requirements.<sup>31</sup> The licences also included an option for the licences to be re-farmed for 3G use once the EU framework was determined and ARCEP announced on 5 July 2007 that the operators will be allowed to use their 900MHz spectrum for 3G from as early as 2008. ARCEP is also seeking to encourage a new 3G entrant including through the offer to re-assign 5MHz of the existing operators’ 900MHz spectrum (from the end of 2012 in very dense areas and from the end of 2009 elsewhere) and to require the existing operators to allow national roaming of 3G customers onto their GSM networks.

The French Government had also imposed a range of obligations in relation to the 3G licences that were issued in July 2001. Reflecting revised economic and technical forecasts, the licence terms and conditions were subsequently revised on four occasions: in December 2002 to reduce the licence price and extend the term and to allow sharing of antennae, base stations and RNC; in March 2004 to extend by 28 months a coverage requirement on the two major operators; and in May 2005 to extend similarly the launch date for the third operator.

31. NCC website, “Licensing Framework for Unified Access Service in Nigeria”.

Finally, where obligations are imposed, then it is important that regulators recognise the significant cost that can be incurred by operators in meeting those obligations. In particular, the cost of extending coverage to more and more remote areas can increase substantially while there may be relatively few customers in those areas from which to help recover the cost. In France, the cost of meeting the licence obligations was explicitly taken into account in the setting of the licence fee.

### Obligations designed to promote competition

A number of regulators have chosen to impose obligations designed to promote competition, such as the provision of national roaming to new entrants or access to wholesale services to MVNOs and service providers. Before such obligations are imposed, an assessment should also be made of their benefits and costs as well as potential alternative measures to promote competition. In this regard, relevant considerations are:

- What would be the level of competition in the absence of the obligations? Where competition is already expected to be effective then imposing additional obligations may bring little additional benefit while carrying costs.
- Would operators offer national roaming and MVNO access commercially even without being required to do so by an obligation? The provision of these services bring additional revenues to an operator and operators may also decide to offer the services if the alternative is that a new entrant simply acquires the services from a rival operator. Incentives to offer MVNO access are likely to be stronger where there are more operators already in the market and where the MVNO offers differentiated services to the existing operators.
- What are the costs associated with imposing the obligations such as in relation to deterring investment by the incumbent or new entrant given the potential for access prices to be set too low? An entrant may be unlikely to incur the risks of building its own network if it could obtain cost-based access to an existing network.
- What are the costs and benefits of alternative policies to promote competition such as releasing additional spectrum or introducing mobile number portability?
- Should the obligations be imposed on all operators in the market or only operators assessed as possessing significant market power? Even where such obligations are imposed initially, regulators should undertake periodic reviews of the competitiveness of the market to determine whether such obligations continue to be required.

Even where such obligations are imposed initially, regulators should undertake periodic reviews of the competitiveness of the market to determine whether such obligations continue to be required.

### 5.3 Recommendations

Following are our key recommendations in relation to non-price terms and conditions.

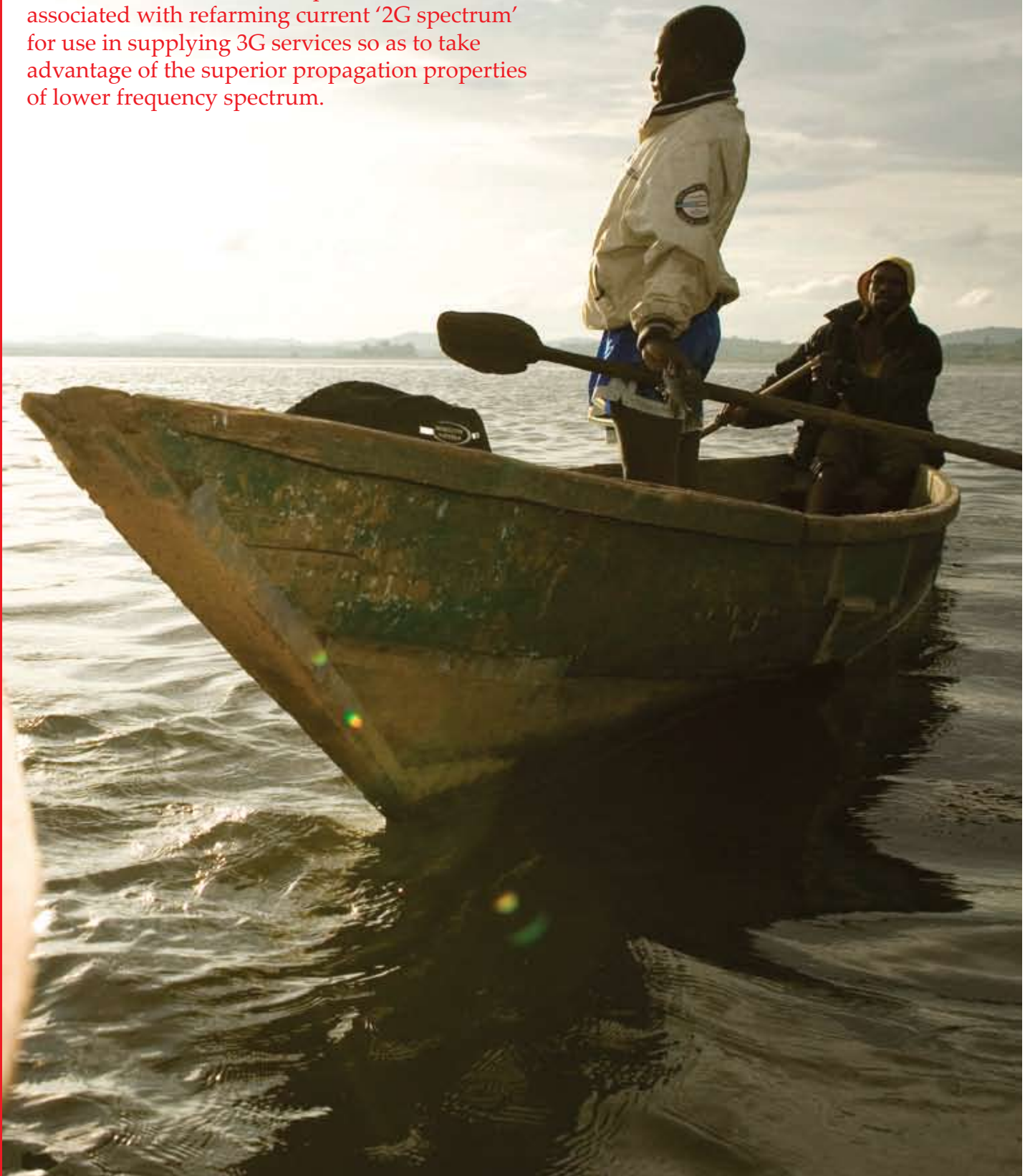
**Recommendation 9** – Governments should introduce licence terms for mobile operators that are in line with the expected payback period for the investments.

**Recommendation 10** – As an alternative to licence obligations, governments should determine whether universal access and competition objectives can be better achieved through policies that help to change the underlying economics of extending access or entering the market or through alternative targeted regulation.

# 6

## Refarming

One of the key current issues facing both developed and developing countries is how to support the transition to third generation mobile services so as to realise the benefits from more efficient delivery of existing services as well as the introduction of new services. In this section, we consider the benefits and implementation issues associated with refarming current '2G spectrum' for use in supplying 3G services so as to take advantage of the superior propagation properties of lower frequency spectrum.



## 6.1 Benefits of refarming

3G technology offers significant technological advantages and consumer benefits compared with 2G technology. However, its success to date has been limited by its use generally being restricted to a relatively high frequency band particularly at 2100MHz. The ability for operators to refarm lower frequency bands, currently used for 2G services, is estimated to generate substantial economic benefits. For instance, a study for the GSMA has estimated that use of 3G technology in the 900MHz band would dramatically reduce the cost of coverage for mobile services, especially into rural areas, enabling more extensive coverage and lower priced services.<sup>33</sup>

In December 2006, the European Conference of Postal and Telecommunications Administrations (CEPT) established the necessary general conditions for operation of 3G systems in the GSM frequency spectrum and the European Commission proposed in July 2007 the liberalisation of the use of 900MHz and 1800MHz spectrum for 3G use. 3G is already being used in Finland in the 900MHz range and refarming is already allowed in a number of other countries including Hong Kong (see Box 5) and, from 2008, in France and Switzerland. The GSMA study found that the benefits would be maximised by coordinated introduction of refarming internationally so as to reduce equipment and device costs. We also note that in relation to CDMA technology, licences were awarded in some countries without specifying 2G or 3G and operators in these countries have been able to migrate seamlessly to the next generation technology.

Allowance for refarming at the time of the renewal of mobile licences, if not earlier, will be important to enable consumers to gain the benefits of refarming in a timely manner.

### Box 5 – Refarming in Hong Kong

The Hong Kong Government has maintained a policy of allowing mobile operators to choose to use 2G or 3G technology in the spectrum assigned to them under their “2G licences” (i.e., around 900MHz and 1800MHz). In particular, the Hong Kong Third Generation Mobile Services Licensing Information Memorandum issued in July 2001 stated that: “existing 2G Operators will be allowed to re-farm the spectrum for 3G, if they so wish, under the current terms and conditions of their existing Licences for the remaining period of validity”.

The ability for the spectrum to be refarmed was confirmed in a statement from the regulator, OFTA, on 29 November 2004 offering a right of first refusal for new licences for the spectrum to the existing GSM and PCS operators whose licences were due to expire in 2005 and 2006.<sup>34</sup> OFTA also decided to gradually increase the spectrum usage fee for the “2G spectrum” so that it would be aligned with the fee for the 3G licences, i.e., at a 5% royalty on annual network turnover (subject to a minimum of HK\$145,000 per MHz per year). The transitional period was given in recognition that 3G equipment for use at the lower frequency was not available at the time and that it would take a number of years for operators to upgrade their networks.

The two CDMA and TDMA operators were not permitted to renew their new licences on the grounds that the operators were making poor use of the spectrum and that the technology was becoming obsolete. The operators were required to migrate their customers to other networks within three years. The vacated spectrum was to be re-assigned including for EGSM.

## 6.2 Implementation issues

In this section, we consider a number of implementation issues associated with refarming of current “2G spectrum” for 3G use.

### Interference issues

In relation to their own customers, operators are likely to be in the best position to decide when they should re-use current 2G spectrum for 3G use. However, the congested nature of the current 2G spectrum bands raises the importance of ensuring that refarming by one operator does not adversely impact the services of other operators. 2G services are expected to continue to be significant for many years so that managing interference issues between 2G and 3G services in the same band will be important. In addition, managing interference effects with neighbouring countries will also be significant in many cases, again underlying the importance of international harmonisation.

### Competition Issues

One issue raised by the introduction of refarming has been the potential impact on competition. Some 3G-only operators have raised concerns that they will be disadvantaged unless they also receive access to previous 2G spectrum. These concerns have led to some regulators such as ARCEP in France and Ofcom in the UK proposing to re-assign some 900MHz spectrum to achieve a more uniform distribution of spectrum across operators.

As discussed in Section 3.2, care needs to be exercised in determining whether an existing licensee should not be allowed to renew its licence for competition reasons. In particular, the regulator should consider whether the market would be effectively competitive without a re-assignment of spectrum between operators, whether alternative spectrum could be made available and whether the re-assignment would generate a sufficient benefit in terms of promoting competition to outweigh any potential harm to investment. Detailed examination of the costs and benefits of re-assigning different proportions of the available bandwidth may help in determining an appropriate balance.

## 6.3 Recommendations

Following is our key recommendation in relation to refarming.

**Recommendation 11** – Governments should permit spectrum currently used for 2G services to be refarmed for 3G services with any implementation issues being resolved as a priority so as to realise the consumer benefits from the delivery of 3G services at a lower bandwidth.

33. Ovum, UMTS900 Benefits and Issues, February 2007.

34. OFTA, Licensing of Mobile Services on Expiry of Existing Licences for Second Generation Mobile Services - Statement of the Telecommunications Authority, 29 November 2004.

# 7

## Longer term issues

In this final section, we consider a number of longer term issues in relation to spectrum licensing. In particular, we consider the role for spectrum trading and spectrum liberalisation. We distinguish between spectrum trading in which the spectrum licence may change hands but in which the spectrum is used to supply the same service (e.g., a sale of spectrum rights between two mobile operators) and spectrum liberalisation in which the technologies and services used in relation to the spectrum band may also change.

We classify spectrum trading and liberalisation as longer term issues as they are potentially more complicated to implement than many of the other measures discussed earlier in the report. Indeed, generally they have been implemented only on a limited scale even in developed countries. In many developing countries, large gains can be achieved through simpler measures such as conducting spectrum audits and ensuring that all valuable spectrum has been assigned for use. Nonetheless, governments should be aware of the underlying benefits that can be obtained through greater liberalisation and consider what steps can be undertaken to achieve greater liberalisation in time. A experience with trading and liberalisation grows in developed countries, developing countries will then be well placed to learn from the experiences of the more mature markets.



## 7.1 Spectrum trading

Secondary trading of spectrum rights is the ability of a current licence holder of spectrum bandwidth to re-sell its rights to use all or part of its allocated spectrum at commercially negotiated terms. In this section, we first outline the benefits of spectrum trading before briefly reviewing the experience of countries in which trading has been introduced. Finally, we turn to consider specific implementation issues and identify regulatory best practice.

Economic theory identifies a number of significant benefits from the introduction of spectrum trading including that trading:

- promotes efficient spectrum use by enabling spectrum to be acquired by the operators who can generate the greatest value from the use of that spectrum. At the same time, the ability to trade spectrum provides the incentive for licensees who have unused or underutilised spectrum to on-sell their spectrum to those who can make better use of it. As such, trading is likely to result in more efficient use of spectrum. In particular, by helping to reduce spectrum shortages faced by operators facing high demand, trading can support expansion in service volumes, increase quality of service and reduce service prices.
- enables those parties who have the best information, the individual users of spectrum, to make the decisions that determine the allocation of a resource among competing uses and users. Secondary trading in spectrum can also overcome inefficiencies in the initial allocation of spectrum.
- allows flexibility and speed in re-assignments between users helping to facilitate the introduction of new services.
- reduces operators' sunk costs and risks, i.e., operators will be more willing to invest in spectrum for innovative services with the knowledge that they have the ability to sell the spectrum rights should the services not be successful

Spectrum trading has been introduced in Australia, Canada, Guatemala, New Zealand, Norway, the USA and the UK and on a more limited basis in Austria, France, Germany, the Netherlands and Sweden.<sup>35</sup> Guatemala's experience is set out in Box 6. The Hong Kong regulator has proposed the introduction of spectrum trading in the longer term.<sup>36</sup> In other countries, individual spectrum trades have sometimes been allowed after regulatory review. The degree to which spectrum trading has been undertaken in the countries that allow trading is mixed<sup>37</sup> and this is likely to reflect the extent to which spectrum rights are currently assigned to the operator than can make best use of it as well as factors potentially inhibiting trades such as spectrum licences being of limited duration.

Spectrum trading is not a panacea. For instance, it would not deal with restrictions on the total amount of bandwidth available to mobile services, which would continue to require governments to allocate more bandwidth or enable spectrum currently being used for other services to be used for mobile. However, trading can reduce the cost of spectrum shortages by allowing some re-allocation between users.

Even for one country, there are substantial differences in relation to estimates of the magnitude of the benefits from spectrum trading. Ofcom estimated that the introduction of spectrum trading in the UK would generate overall benefits in the range of a net present value of £142 million over 20 years, up to several

billions of pounds a year.<sup>38</sup> The benefits will depend on the extent to which current spectrum allocations in a particular country are constraining existing operators from expanding their services or constraining new operators from entering.

### Box 6 – Spectrum trading in Guatemala

In 1996, the Guatemalan National Assembly enacted a new telecommunications law,<sup>39</sup> which, among other policies, introduced secondary trading of spectrum for some frequency bands.

Rights to use regulated frequency bands (TUFs) are granted in fully transferable and fragmentable usage titles, i.e., they can be totally or partially rented and/or transferred. TUFs have no service limitation, and existing users are granted flexibility in the utilisation of spectrum as long as emissions are confined to the original bandwidth assigned. TUFs are subject to two interference limits: a "maximum effective radiation power" and a "maximum potency admissible in the coverage area". The regulator can impose fines for cases of repeated abuses, i.e., where interference exceeds allowed levels. If the abuse is established, the harmed user can also file a claim for damages or other remedies in the courts.

Spectrum trading in Guatemala appears to have been a significant success. Over 41 per cent of TUFs had been traded by 2004.<sup>40</sup> Liberalisation in Guatemala has resulted in more spectrum becoming available for key services such as mobile services and has reduced entry barriers. Competition has been strong in Guatemala's relatively unconcentrated mobile market, resulting in among the lowest mobile prices in Latin America and continuing high rates of subscriber growth (despite its relatively low GDP per capita and law and order problems).<sup>41</sup> Interference issues are mostly minor with tight deadlines for their resolution, although an issue has been irregular enforcement of restrictions such as in relation to pirate radio.<sup>42</sup> Other practical problems have included spectrum hoarding and difficulties in retrieving spectrum for licence exempt use.

### Implementation issues

Markets work best when they are based on well-specified, enforceable, property rights, low transactions costs, and competition. If these features are not present, secondary trading may be inefficient or distorted. In this section, we explore the steps that can be implemented to facilitate spectrum trading in the longer run. In principle, spectrum trading (with no change in the technology and services being provided using the spectrum) should not lead to greater interference problems. However, the prospect of spectrum rights being re-assigned between users does increase the risk of inadvertent interference as well as raising a range of other implementation issues. While the general introduction of spectrum trading at this stage is unlikely to be a high priority for many developing countries, licensing authorities should be prepared to assess proposals for particular trades subject to consultation and detailed examination of any risk of heightened interference.

35. Information on Norway's general approach to the transfer of frequency licences is available on the frequency management section of the NPT's website.

36. Communications and Technology Branch, Hong Kong Government, Radio spectrum policy framework, April 2007.

37. See, for example, Ovum et al, Spectrum policy review – final report, 2006 and Analysys et al, Study on conditions and options in introducing secondary trading in radio spectrum in the European Community, May 2004.

38. Ofcom, Spectrum trading – Regulatory Impact Assessment.

39. Ley General de Telecomunicaciones, D.C.A. 14 November 1996.

40. Ovum et al, Spectrum policy review – final report, 2006, p.145.41.Leighton, W., "Telecom reform in Guatemala: A case study in spectrum liberalisation", Presentation to National Academy of Science Workshop, 1 March 2006.

41. Ibid.

42. Wellenius, B. and I. Neto, Managing the Radio Spectrum: Framework for Reform in Developing Countries, 19 June 2007, p.9.



## Well-specified spectrum rights

Markets are based on a private property rights system. Trading bandwidth requires a clear and commercially sensible and defensible definition of initial property rights or entitlements. A spectrum licence may specify the right to exclusive usage in terms of frequency and geography (and potentially in relation to a time dimension) as well as reasonable interference levels both in terms of allowable levels of interference caused by the licensee to other spectrum users and the maximum levels of interference which the licensee must accept experience from others. As experience of spectrum trading in developed countries grows, developing countries will be well-positioned to learn from their experience enabling trading to be introduced in the longer term at lower risk.

However the definition of well defined, technology neutral, property rights has proved to be very complex, and there is no universally agreed right adopted by the ITU or CEPT. In general, the more flexible the property right that is used, the more problematic interference control becomes. Regulators should do a careful cost benefit analysis about what level of flexibility is appropriate for their market. This is important in the absence of an internationally agreed definition of such a well defined and enforceable spectrum property right. It may be that in some markets, most of the economic benefits flow from allowing trading within use.

## Licence renewal

Uncertainty over future rights to use the spectrum can act as a major barrier to spectrum trading. There may be few buyers of spectrum rights if there is only a short tenure left and significant uncertainty over whether a right will be renewed. The lack of a commitment to renewal has been identified as a key factor holding back trading in Australia.

## Transactions Costs

Transactions costs will also affect market efficiency. These will in part be a function of the frequency and ease of spectrum trades. In the absence of the ability to re-sell spectrum licences, the only way spectrum can be traded may be by acquiring a firm which holds a licence. Apart from the costs of doing this, and the subsequent costs and losses of disposing of other assets owned by the acquired company, the licence is for a large amount of bandwidth. Secondary markets should allow parties to divide or aggregate spectrum.

## Competition Issues

Governments may be concerned that spectrum trading would lead to the largest operators buying up spectrum rights so as to gain or consolidate market power in the downstream markets for the services supplied using the spectrum. One response to this concern has been the imposition of caps on the amount of spectrum able to be acquired by any one operator. However, while such caps are relatively simple to apply, they are an imperfect way of protecting competition because they are not based on an assessment of the particular competition implications of the specific transactions

Whether spectrum trading would actually lead to a loss in competition would depend on: (i) the amount of spectrum available to competitors; and (ii) the degree of competition in the downstream markets. Accordingly, whether a particular transaction should be prohibited on competition grounds is likely to require a case-by-case review which could potentially be under general competition law (as, for instance, occurs in New Zealand). Safe harbours could be determined, for example, and spectrum acquisitions could be permitted if the operator has a current market share below a particular level and if the spectrum being acquired represents only a small share of the total spectrum suitable for supplying that service.

## Concerns about windfall gains

Another concern about the introduction of spectrum trading is that it may result in existing licensees earning significant financial gains over the price that they originally paid for their licences. It may be argued that such gains should belong to the government. However, the gains provide the incentive for spectrum trades to take place and the more the government confiscates these gains, the more likely it will be that a trade does not occur even when it would have generated overall benefits to society. Further, the experience with some 3G licences in Europe shows that operators may experience significant losses acquiring licences so the opportunity to earn some gains may be seen as the counterpart to the risk of significant losses if market conditions do not turn out as expected.

Governments will need to determine how best to meet their revenues requirements taking into account principles of efficiency, equity and simplicity. A large tax on gains from spectrum sales would be likely to come at a substantial cost to efficiency. There would appear to be no reason to tax gains from spectrum sales any more than gains on the sale of other business assets.

## 7.2 Spectrum liberalisation

Spectrum liberalisation goes beyond refarming and trading to give owners of spectrum rights the freedom to change the use of the spectrum to any technology or service subject to pre-defined technical standards designed principally to minimise radio spectrum interference but little else. In principle, spectrum liberalisation can generate significant benefits by enabling spectrum to be more quickly allocated to higher value uses as demand and technology factors change the relative valuation of spectrum in different uses. In comparison, where regulators specify the use in licences, there may be long delays before new uses are permitted and even then the regulator may not always make the best choice.

Spectrum liberalisation does not imply no restrictions on the use of spectrum. Rather, liberalisation changes the balance of who is responsible for determining those restrictions from the regulator to the holders of spectrum rights. Liberalisation requires clearly defined and enforceable exclusive property rights (spectrum usage rights). Initially, these can be based on maximum interference levels that would not impair the quality of existing spectrum use, particularly in terms of power limits at geographic and frequency boundaries.

International experience with spectrum liberalisation remains very limited with forms of liberalisation being introduced in Australia, Guatemala, New Zealand, Norway and the US.

For most developing countries, attempting greater liberalisation at this stage may risk serious interference problems such as could occur if spectrum usage rights are poorly defined. As such, more limited liberalisation of the form of the managed introduction of 3G refarming may enable specific benefits from changes in use to be realised without risking the delivery of current services at acceptable quality levels. Consultation with the industry and customers, and recognition of existing investments and legitimate legacy issues, will be important. Ongoing international and regional harmonisation of spectrum, including through ITU coordination and harmonisation, will also be important to continue to generate benefits such as in terms of lower equipment prices and the ability of customers to use their devices while travelling.

## 7.3 Recommendations

Following are our key recommendations in relation to spectrum trading and liberalisation.

**Recommendation 12** – There continue to be significant costs and risks associated with the general introduction of spectrum trading and liberalisation in developing countries at this stage and licensing authorities should consider whether to approve particular proposed trades or changes in use on a case-by-case basis and subject to initial consultation and examination to guard against the risk of increased interference.

**Recommendation 13** – To facilitate the longer term introduction of trading and liberalisation, licensing authorities should consider the greater specification of current right to use spectrum particularly in regard to key parameters such as frequency, geography and allowable interference levels.