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THE REGULATORY ENVIRONMENT FOR FUTURE MOBILE MULTIMEDIA SERVICES

TOWARDS MORE FLEXIBLE SPECTRUM REGULATION

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1. THE CHANGING ENVIRONMENT

The demand for radio-based applications continues to grow in line with the increasing mobility of the communication society. This demand can only be satisfied, however, if there is sufficient spectrum available. Furthermore, the pace of technological change, with accelerating cycles of innovation, calls for a regulatory regime that makes suitable spectrum available as quickly as possible.

The radio spectrum is a key resource for many essential services in society: Mobile, wireless and satellite communication, TV and audio broadcasting, transport, radio-navigation (GPS/Galileo) as well as numerous other applications (alarms, remote controls, hearing aids, microphones, medical equipment etc.). Radio technology also supports public services such as defence, security/safety and scientific activities (e.g. meteorology, Earth observation, radio astronomy and space research). Radio-based systems also play a major part in developing rural areas, where the use of cables is not widely spread and economically not viable. Radio spectrum therefore plays an important role in bridging the "digital divide" and creating a global information society – which is one of the ITU's key objectives.

The ITU plays an important role in the further development of the global information society, by promoting the global dialogue and cooperation between member states and sector members fostering the introduction and spread of modern communication systems for the benefit of society at large, while paying particular attention to the special needs of developing countries.

The main instrument for managing the radio-frequency spectrum globally is the "Radio Regulations", which celebrate their 100 anniversary this year. They regulate the global allocation of spectrum to different services. In doing so, they offer the member states as much flexibility as possible to adjust the framework conditions to specific regional or national requirements. In the course of the globalisation of markets, a trend towards ever closer harmonisation of services is becoming apparent. Creating a global, proactive system for managing radio spectrum can therefore contribute greatly to stimulating growth, competitiveness and employment.

The importance of spectrum policy decisions is underlined by their effects on the development of mobile communications e.g. in Europe. In the 1980s mobile communications presented only a small market fragmented at national level ("monopoly with competitive fringe"). Meanwhile it has developed into an industry, which in 2004 alone contributed 105.6 billion € to the GDP of the 15 old EU states. The mobile services industry is estimated to have created around 2.8 million jobs in the EU 15. According to current trends this industry will soon overtake in turnover the agriculture sector or the electricity, gas and water industries put together (source: Ovum Study on mobile services for GSMA, 24/12/2004) [1].

This development can be attributed to an ever increasing popular demand for mobile telecommunications services. It is not least the resulting new technical possibilities and the further spread of the internet that will contribute to greater demand for higher transmission rates in connection with greater mobility in the near future. In addition an increasing number of fixed-line connections will be replaced by wireless, radio-based connections such as Wireless Local Area Networks (WLAN) or Bluetooth. This development promotes and accelerates the creation of an "always on" scenario, where everyone has access to the services and information important to him – anywhere, anytime.

The importance of technical progress for creating a global information society was already acknowledged and underlined in the ITU "Radio Regulations", which oblige the member countries to make every conceivable effort to apply and promote the latest technological development. Therefore everything must be done to best promote the international regulatory framework for the introduction of new technologies that will benefit society, without unnecessary barriers that lead to delays which are counterproductive to society and economy.

However, the available radio spectrum is limited. For that reason a model of forward-looking, non-discriminatory and pro-active spectrum management is necessary, which not only takes into account the interests of users and facilitates the development and use of innovative technologies, but also ensures an efficient and interference-free usage of frequencies as well as fair and effective competition.

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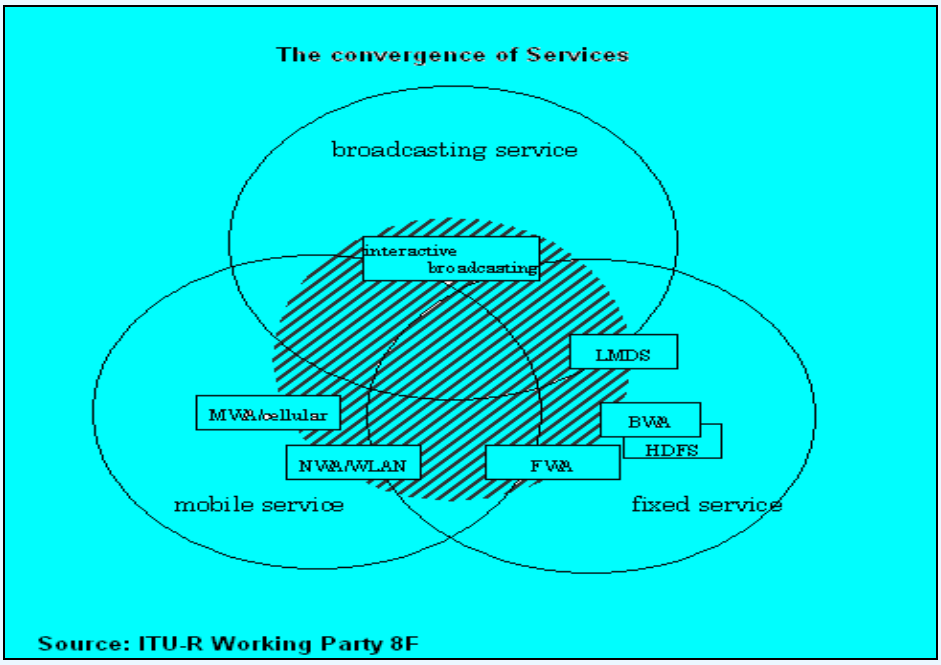
[1] See Communication from the Commission to the Council and European Parliament - A Forward-looking radio spectrum policy for the European Union - Second annual report - COM(2005)411 final

These developments, driven by technological and market forces, present spectrum regulators with major challenges. On the one hand spectrum must be provided to meet demand, i.e. at the right time, in the right quantity and, if possible, for multiple applications. On the other hand it must be ensured that spectrum use is efficient and interference-free and that there is a level playing field for competitors, as well as working to establish sustainable market competition.

In the past the delineation according to services and markets was relatively straight forward: There was generally only one technology that could be used to offer specific services, so that the different services could be defined by means of the technology employed. Nowadays this is no longer possible. On the one hand technical progress and the convergence of services and technology facilitate the use of new technologies for a variety of services; on the other hand different technologies can be employed to offer the same service. Even within different types of services there is a recognisable trend towards ever greater convergence. One example is the disappearing demarcation between broad band access for fixed radio services and congruent systems for mobile and broadcasting radio services.

The further development of existing and the development of new digital technologies results in a situation where a particular technology could easily be used to offer a combination of communication services such as TV, telephony and broadband access. And due to technical progress it is getting ever cheaper to build appliances in such a way as to enable their operation on different frequencies. The further development of "Underlay"- and "Overlay"-technologies as well as the introduction of Software Defined radio and Cognitive radios will further ease the efficient use of the spectrum and the seamless change between different access platforms. The future model must be sufficiently flexible and adjustable to allow society to actually make use of the advantages of such developments. This provides important opportunities to not just improve competitiveness, further industrial development and create jobs, but also to foster innovation and give citizens more options to choose from.

Figure 1: The convergence of services
Mobile, broadcasting, fixes services



Source: ITU Working Party 8F

The convergence of services has put pressure on the international and national regulatory framework to stay abreast of developments by adapting more quickly, abolishing unnecessary barriers and introducing greater flexibility. The future overall concept of a flexible spectrum management regime must foster innovation and employment by abolishing the restricted access to frequencies used for new radio technology. This requires

a flexible design for the dedication of spectrum as well as the definition and regulation of frequency usage rights, without too narrowly constricting service-specific requirements. The mental reconstruction of spectrum management as a preparation for and basis of future decisions and market liberalisation is one of the most pressing tasks. One example in case could be the frequencies used for "Broadband Wireless Access" in the band 3.5 GHz. In order to allow for a diversity of business cases, the dedication of spectrum as well as the definition of the usage conditions should be designed as flexibly as possible. Even though the dedication of spectrum is currently still restricted to fixed radio services, a trend towards mobile use is already conceivable and should therefore not be prevented by regulatory intervention. With this development the delineation between mobile radio services and fixed radio service is likely to disappear in the foreseeable future.

The goal of ensuring that at any point in time, spectrum usage rights should be held by the person “best” able to use that spectrum, is not the only factor to consider when regulating frequencies. For instance, spectrum usage can be impaired by interference, which is caused by two users operating at a similar frequency. Any model used to distribute spectrum must take this factor into account. The public interest, something ignored in purely commercial transactions, also plays a part; there must be sufficient spectrum available for public broadcasting and governmental usage, for example. Competition policy is a further factor to be taken into consideration, whereby the relative transaction costs of *ex ante* and *ex post* regulation should also form part of the equation.

2. PAVING THE WAY TO MORE FLEXIBILITY[2]

Efforts to introduce a more flexible approach to spectrum regulation fall into two broad categories: Liberalisation and spectrum trading/transfer, terms that are now widely used worldwide. *Liberalisation* addresses the extent to which spectrum usage rights should still be restricted and indeed whether any such restrictions are needed. *Spectrum trading*, on the other hand, focuses on the options available for transferring spectrum and the detailed institutional arrangements for a spectrum trading regime. In some countries, such as the UK, the topic of *spectrum pricing* is being discussed at the same time as liberalisation and spectrum trading.

2.1 Liberalisation

Spectrum usage rights are subject to certain conditions. In the past, these have tended to impose fairly tight restrictions, for example on the services that could be offered in a particular frequency band, and even on the technologies that could be used. Liberalisation, however, seeks to lift such restrictions wherever possible. In a fully liberalised environment, there would be no restrictions on spectrum usage whatsoever. Extensive liberalisation tends to offer the advantage that each frequency band is used for the most attractive service. In other words, there are no stipulations that would create an artificial scarcity of certain applications. This would also tend to ease the scarcity of spectrum for economically attractive applications such as mobile communications or broadcasting, thereby providing a possible boost to competition in these markets. On the other hand, flexible usage has the potential to cause considerable interference, while in certain areas it can actually make very good sense to internationally harmonise conditions of use. Although carefully defined rights of use should impose as few restrictions as possible, it is nevertheless important to establish a series of conventions.

Expanding the usage rights of current users presents the difficulty of how to introduce a more flexible regulatory regime in a non-discriminatory fashion. This applies both to a broadening of the conditions of use and to liberalisation. It may be the case that, by expanding spectrum usage rights, the regulator is discriminating against those who were unsuccessful at the time the spectrum was originally assigned, regardless of whether this took place via an auction or a beauty contest. It must be emphasised, however, that

[2] See “Towards More Flexible Spectrum Regulation”, Study for BNetzA by WIK-Consult, Background Paper for ITU New Initiatives Workshop (www.itu.int/multimobile), at www.bundesnetzagentur.de/media/archive/4745.pdf

an expansion of existing spectrum usage rights does not automatically constitute discrimination. Irrespective of these considerations, there are various tools that can be used to counter potential discrimination.

2.2 Spectrum Trading

Spectrum trading, or the transfer of spectrum usage rights, denotes a mechanism whereby rights of use are transferred from one user to another for a certain price. In contrast to a system in which spectrum is returned and then re-assigned, the trading approach is characterised by the fact that:

The transfer of the right to use the spectrum in question is initiated voluntarily by the present user. The sum paid by the new owner of the spectrum usage right is retained, either in full or in part, by the previous owner.

Spectrum trading can contribute to a more efficient use of frequencies. This is because a trade will only take place if the spectrum is worth more to the new user than it was to the former user, reflecting the greater economic benefit the new user expects to derive from its use. In the absence of misjudgements or irrational behaviour on the part of the buyer or seller, and if the trade does not cause external effects, then it can be assumed that spectrum trading contributes to greater economic efficiency. Furthermore, the option of trading creates an incentive for the voluntary transfer of rights of use. As well as this direct effect, which at the same time boosts transparency by revealing the true opportunity cost of the spectrum, secondary trading also results in a series of indirect positive effects. Spectrum trading makes it possible for companies to expand more quickly. It also makes it easier for prospective new market entrants to acquire spectrum in order to enter the market. And if the introduction of spectrum trading is combined with an extensive liberalisation of spectrum usage rights, there will be a considerable incentive for incumbents to invest in new technology in order to ward off the threat of new entrants in the absence of other barriers to entry (i.e. the unavailability of spectrum). This in turn will boost market competition. These efficiency gains will not be realised, however, if transaction costs are too high or if external effects intervene. Possible external effects include anti-competitive behaviour and interference. In addition, it is important to ensure that the spectrum allocated for merit goods, such as governmental communications and the emergency services, is available in sufficient quantity and quality.

These criteria constitute the framework for a whole raft of institutional arrangements that determine the precise form of spectrum trading and set forth exactly how rights of use can be transferred. Institutional arrangements stipulate precisely who can make what decisions, when they can do so and under what conditions. They also set forth the implications this will have for the parties involved. Ideally, such a system will include full details pertaining to all aspects of spectrum transfers and trading. At the same time, one of the aims of any spectrum trading regime should be to keep down transaction costs. After all, the goal is to facilitate transfers by establishing a swift and inexpensive mechanism. However, the vast quantity of important details means that both primary legislation and secondary legal texts are limited in terms of how far they can specify actual arrangements.

Windfall profits accrue to owners of specific property rights without any effort or economic activity on their part. It is not clear just how precisely the term “windfall profits” has been defined in the context of assigning spectrum usage rights. The basic premise holds that a distribution of scarce resources gives the recipients an opportunity to make a profit. If they do so as a result of commercial activity, associated with the roll-out of a network infrastructure, then there are no grounds for censure. On the contrary, there would only be cause for concern if it were possible for the user to make excessive profits without taking on correspondingly higher risks, or if profits could be made simply by trading, without engaging in any productive activity. The latter might be the case if, for example, spectrum usage rights could be acquired for a comparatively low price in a lottery and then, without the owner having put the spectrum to economic use, sold for a much greater sum either shortly afterwards or at a later date. Such cases raise doubts about profits of this kind, which are ultimately an outcome of quasi-monopolistic or -oligopolistic markets (the result of a system that grants exclusive usage rights). These profits may be considerable and the question is: Can they be justified in terms of the distribution of welfare benefits?

Windfall profits that result solely from trading might be viewed as problematic in terms of the equitable distribution of welfare benefits among economic actors. They do not, however, have an immediate impact on economic efficiency. On the contrary, any attempt to block trading may even prevent spectrum from being transferred to the most efficient user.

From a purely economic standpoint, windfall profits do not constitute an argument against spectrum trading. If, however, they are regarded as problematic for other reasons, there are various means of limiting such gains in the context of spectrum trading. First of all, usage rights should initially be assigned in an auction. Other options include a spectrum charge, effective market regulation, a windfall tax or a trading duty whereby the state recoups a proportion of the net gain when a trade takes place.

2.3 Spectrum Pricing

Administrative incentive pricing aims to ensure that spectrum is used efficiently, and addresses both static and dynamic efficiency. If spectrum was initially assigned in an economically efficient auction and if the usage rights can then be traded, there is some doubt as to whether charges of this type are necessary if transaction costs are negligible. Imperfections in the auction design, incomplete information and transaction costs may, however, mean that it is advisable to implement AIP so that spectrum is used more efficiently. In addition to the incentive effect, spectrum charges can also be treated as a source of revenue for the government. As a general rule, AIP should result in a higher charge than would be levied under an administrative pricing model. This way, in addition to shaping market behaviour, it also has an impact on the public finances.

There are a range of methods for determining the economic value of spectrum usage. One such method is to calculate the discounted cash flow (income minus expenses) of an assigned right of use with regard to the business model of which it forms a part. Alternative methods focus on the relative costs of using other services or technologies. Ideally, it would be possible to calculate the precise opportunity cost, which represents the economic value associated with the best alternative use of the spectrum. Whichever method is chosen, it throws up numerous questions of methodology and design, to which there are no simple answers. This is likely to result in workable solutions being employed to meet theoretical standards. Furthermore, owing to missing or incomplete information, the figures that emerge will at best be estimates. This means that care must be taken in order not to overestimate the economic value of spectrum usage. Taken to an extreme, this would result in rights of use being overpriced and not taken up by prospective users.

Efforts to establish a competitive market structure do not stop at spectrum assignment. Unrestricted spectrum trading could be exploited by users acting in concert to create a monopoly or at least a more concentrated oligopoly. Spectrum regulation must therefore be a permanent fixture; the responsibility to counter anti-competitive practices does not end with the assignment process. In an extreme scenario, unregulated spectrum trading might result in all frequencies being transferred to one company, with benefits (and disbenefits) distributed by means of a profit and loss transfer agreement. If competition authorities were then to intervene ex post, they would be faced with the difficult task of gathering sufficient information in order to prove wrongdoing.

3. THE DIGITAL DIVIDEND

By changing from analogue to digital TV broadcasts fewer broadcasting frequencies will be required while preserving the same image resolution and size and the same number of channels. That means that part of the frequency bands currently allocated to terrestrial broadcasting could possibly be released and made available again. This capacity increase of available spectrum is often called “digital dividend.”

Given the fast evolution of broadcasting services and the increasing effect of technical convergence, combined with technological developments, to creating new service opportunities, it is not possible at this juncture to predict the relative weight of future demands on spectrum resources - especially as, on a global level, there will be considerable divergences in the timing of introducing digital broadcasting. In Europe the target year for analogue switch-off is the year 2012.

One of the key questions in connection with the transition to digital broadcasting is the best possible use of the spectrum becoming available again. In principle the following categories can be distinguished[3]:

[3] See the RSPG Opinion on the “Impact on spectrum of the switchover to digital broadcasting”, www.rspg.groups.eu.int

- Spectrum needed to improve terrestrial broadcasting services: e.g. services with higher technical quality, increased number of programmes and/or enhancement of TV experience (e.g. multi-camera angles for sports, individual news streams or "quasi interactive" options);
- Radio resources needed for “converged” broadcasting service, which are expected to be primarily “hybrids” of traditional broadcast and mobile communication services;
- Frequencies to be allocated new uses, which do not belong to the broadcasting family of applications. Some of these potential new uses of the spectrum dividend are future services and applications which are not yet marketed and others are existing ones which do not operate yet in these frequencies (e.g. extensions of 3G services, short range devices).

Numerous activities are going on to solve the problem of the digital dividend. The Radio Spectrum Policy Group in Europe has already approved an Opinion on this issue and two new groups have been established to consider the introduction of multimedia services primarily in the broadcasting bands and the overall use of the digital dividend.

The result of the Regional Radiocommunication Conference 2006 will have a major impact on the future shape of applications in the broadcasting bands.

4. THE KEY QUESTIONS

The transition to a more flexible regime of spectrum management cannot be achieved through a “Big Bang” but only through a gradual development, step by step. Where frequency usage is concerned there is no such thing as a "greenfield site" but only a heavily used radio spectrum with numerous legacy allocations, which cannot easily be changed in a sudden and unexpected move. Due to the varying characteristics of national telecommunications markets there will not be a "one fits all” solution, either. Instead the international framework must offer sufficient flexibility to adapt to national conditions. Important aspects requiring investigation are the effects of a more flexible design and trading on current market situations in order to prevent a distortion of competition as well as a thorough investigation of potential “windfall" profits. A more flexible design of existing usage rights can either increase or decrease their value. In addition to this aspect, the potential hording of spectrum with a view to hampering competition or sheer speculation is a problem that has not yet been resolved and requires intense discussions. It would therefore not be sensible to suddenly and radically turn away from the regime used to date. Instead, a swift and comprehensive but also diligent transition seems advisable. In doing so the flexible design must not be seen as an end in itself – instead it requires an in-depth appraisal of the consequences, for example on harmonised markets, planning certainty for the economy and efficient use of spectrum.

In addition to the aspects mentioned above it will also be necessary to investigate for which services higher socio-political objectives and interests warrant more extensive specific regulations. Suffice it to mention the aspects of freedom of information and international roaming. Furthermore, cost-efficient systems require appropriate quantities, which in turn require harmonised single markets, at least at regional level.

Issues of interference will also be increasingly difficult to assess in light of a more flexibly designed spectrum management regime. This will require the development of suitable tools to ensure an orderly co-existence of frequency usages, without loosing sight of the efficient usage of spectrum.

These developments are first steps on the road to an overall concept for more flexible spectrum management, aiming to lower barriers for access to spectrum and promote innovation and effective competition in order to offer the consumer the best possible choice between services that can be rendered using these frequencies. Against this background alternative radio-based access technology such as BWA or 3G could play a major part in providing a better broadband penetration for a global society and contribute in particular to improved telecommunications services in developing countries. The greatest challenge in this debate is to define that narrow path between appropriate flexibility and necessary regulation.