No 3

Report from the UMTS Forum

The impact of licence cost levels on the UMTS business case

UMTS Forum

This report has been produced by the **UMTS Forum**, an association of telecommunications operators, manufacturers and regulators active both in Europe and other parts of the World.
The members of the UMTS Forum share the vision of UMTS as a concept that will move mobile communications forward from second generation systems, into the Information Society and deliver voice, data, pictures, graphics and other wideband information direct to people.
The Terms of Reference for the study have been to

- study the reasons for States to apply charges for granting licences, including spectrum licences, with special reference to UMTS;
- study the effects of various levels of such charges, and of the charging conditions;
- formulate recommendations from industry to national regulators concerning the use of charges in this context;

The study has been undertaken by the industry members of the UMTS Forum. The regulatory members have followed the study and contributed to it, but cannot be bound by the text or recommendations.

It is recognised that the responsibility for licensing of UMTS networks is strictly within the competence of the national regulators. In this respect this report offers advice from the industry members of the Forum to national regulators. National regulators are invited to respond to the Forum on this report.

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Executive Summary

The industry members of the UMTS Forum have studied the charges for granting licences, including spectrum licences, with special reference to UMTS, the third generation of mobile telecommunications systems, and have formulated recommendations from industry to national regulators concerning the use of charges. The regulatory members have followed the study and contributed to it, but cannot be bound by the text and recommendations.

It is recognised that the responsibility for licensing of UMTS networks is strictly within the competence of the national regulators. In this respect this report offers advice from the industry members of the Forum to national regulators. National regulators are invited to respond to the Forum on this report.

A charge generally accompanies the issue and use of a spectrum licence. Traditionally, these charges have been used as a means of financing licence administration costs. Recently, the justification for pricing has sometimes also been to encourage licensees to make the most efficient use of spectrum.

There are some spectrum uses for which charging seems impracticable or impossible. For example, no mechanism for charging for unlicensed use of spectrum, such as wireless PABX or cordless telephones, is likely to be practicable. For certain non-profitable services of general interest, charging seems politically and socially difficult to accept.

It should be noted, however, that terrestrial broadcasting should have the same charging rules as competing telecommunication services at a time when the broadcasting and telecommunication services are converging.

Since the number of potential licensees becomes smaller as the cost of spectrum increases, spectrum pricing can also be used as an instrument for selecting licensees in situations where there is a scarcity of frequencies.

Traditionally, the principle First come, first served is the most widespread and longstanding method of selecting licensees. Comparative bidding, sometimes called a beauty-contest, involves selecting the best applicant according to pre-defined selection criteria. Auction, sometimes called competitive bidding, awards the licence to the applicant that makes the highest bid.

A major risk with auctions is that the prices paid by licensees may become excessive. Market theory predicts that auctions will allocate spectrum to those that value it the most and thus will make the most cost-efficient use of the spectrum. However, this does not necessarily mean that the spectrum will be used efficiently from the end-user's perspective.

Auctions are not a universal solution to all licensing problems, and are not suitable for certain types of licences. The use of auctions as a selection mechanism for granting spectrum licences for satellites, for example, should be strongly discouraged. It would create negative effects such as fragmentation of frequency bands, problems with roaming, and high prices for operators and consumers.

An economic business model demonstrates that where licensing fees exceed administrative costs (e.g. because of auction, or excessive annual fees for the right to use radio frequencies) there is a direct negative effect on the development of UMTS services. The results show that the profitability will be reduced and the payback period lengthened, and this deterioration is particularly marked when the licence fee is at a level of 50 USD per capita.

If liquidity is a constraint for an operator, a licensing system based on annual fees may be preferable, since it allows the operator to spread payments over the period and escape large up-front payments. The lower the income for an operator, the greater the impact of licence fees.

For the mobile industry, high up-front licence charges increase investor uncertainty, and correspondingly decrease investment in the network for a new service such as UMTS. In addition, technology choices may be driven by a short-term focus on recovery of up-front fees rather than a long-term focus on overall growth of the industry. This may have potentially irreversible consequences for service provision.

Experience with the US PCS C-block auctions has shown how high charges can undermine a newcomer's viability when it has to roll out a totally new network starting from zero, while existing operators have the opportunity to reuse their infrastructure. This compromises competition.

High up-front licence charges will not facilitate the best services for UMTS consumers. They would increase the cost of services to consumers, and may price some consumers out of the market altogether. Network coverage obligations may be forgotten as the operator concentrates on getting the maximum revenue from the auction, leaving consumers with an under-developed service. In the licensing and pricing of UMTS spectrum, governments seek to encourage innovative and efficient spectrum usage, and ensure the maximum economic return for the government. High up-front licensing charges will not achieve these goals. Up-front investments that are channelled not to spectrum access, but instead to extensive coverage, marketing programs, high quality systems, robust networks and employee training will result in more effective use of the spectrum, and will in the long-term result in more government income.

The industry members of the Forum have formulated the following recommendations to national regulators concerning the use of spectrum pricing:

● Spectrum pricing may be used as an incentive for efficient spectrum use, provided that these charges are fair, proportionate, transparent and competition neutral. They should mainly be motivated by cost-recovery and not by maximisation of revenue. The benefits, however, should be carefully weighed against the potential damage on the service.

● When selection of licensees is necessary because of lack of frequencies, the administrative comparative approach should be preferred over auctions or lotteries. Auctions lead to high up-front fees, which will increase the tariffs for the consumers, slow down the development of new, innovative services, such as UMTS services, diminish the infrastructure investments and harm competition. Lotteries provide no assurance that a competent operator will be awarded a licence.

● Spectrum pricing as an instrument of taxation must be avoided, as it will have a direct negative impact on the growth of the telecommunications market and the general economy. Such taxation will in the long run diminish the total income for the State. High market values should be an incentive for regulators to find more spectrum, which will benefit the public more than excessive transfers of money to the public funds.

● Taking into account that the UMTS market still is in a very early stage of development, any regulatory actions regarding UMTS spectrum should be aimed at encouraging investments in UMTS systems. The calculations of the UMTS business case indicate that high fees will have a negative impact. Large down-payments in the beginning of the licence period should be avoided, in favour of charges related to the use of the system, like royalty or annual fees.

● Due consideration should be given to the particular global nature of satellite systems when seeking to establish a suitable mechanism for defining licensing costs and spectrum pricing for the UMTS satellite component.

1 General

1.1 The legal background and existing situation

1.1.1 UMTS

UMTS means Universal Mobile Telecommunications System. It represents the third generation of mobile telecommunications system, and will be capable of providing innovative wireless multimedia services that are beyond the ability of current second generation system such as GSM. It will combine the use of terrestrial and satellite components.

The long term objective of UMTS is to create networks that will be available and accessible from anywhere in the world, by consumers who want to carry only one item of terminal equipment and still be within reach wherever they are and at any instant.

UMTS will provide ubiquitous coverage by providing combined access to cordless, cellular and satellite networks from a single hand-held terminal.

Governments and regulators have important roles with respect to UMTS. They have to establish a regulatory framework and allocate frequencies, which will encourage innovation, liberalisation and competition in the provision of telecommunication and information technology services.

1.1.2 National regulation

Regulation of the right to use spectrum is essential to ensure that the legitimate users obtain the required quantity and quality of radio communication services without disturbing interference. This is done by using licensing, frequency assignments, technical specifications, and legal enforcement to ensure compliance. Without the appropriate use of licensing, including frequency assignments, the radio spectrum would become unusable.

National regulatory authorities are primarily responsible for regulating the use of spectrum.

1.1.3 International regulation

The Constitution and Convention of the International Telecommunications Union (ITU) together with the Radio Regulations constitute a treaty regarding telecommunications including radio communications. Practically all countries in the world have joined the ITU and are bound by the Radio Regulations. These state that "States shall endeavour to limit the number of frequencies and the spectrum used to the minimum essential to provide in a satisfactory manner the necessary services".

In using frequency bands for radio services, States must bear in mind that radio frequencies are limited natural resources and that they must be used rationally, efficiently and economically so that countries may have equitable access to radio frequencies.

The ITU Constitution also lays down that all radio stations must be established and operated in such a manner as not to cause harmful interference to the radio services or communications of other countries.

Regulatory authorities co-ordinate and regulate their use of the radio spectrum with other countries on a global level at biannual World Radio-communication Conferences (WRC) within the framework of ITU, and within Europe through CEPT/ERC.

1.1.4 Spectrum ownership

There are two approaches to licence assignments:

- In the traditional approach licences are considered, especially as regards spectrum, to give the "right to operate" or "right of use".

- A newer approach is closer to the concept of property transfer. In the case of spectrum, the State sells its spectrum to a private buyer who can in turn resell it to other economic players. This leads to the idea of a market value attached to spectrum.

In the case of spectrum, this newer approach seems to be based on the notion that spectrum is a property of the State that can be transferred to others. However, this approach may be incompatible with international commitments of the State. According to the ITU Radio Regulations, States are bound to comply with restrictions in the use of radio frequencies in their territories. Various limitations apply for frequencies for different applications, such as satellite communications, fixed services, broadcasting, and mobile services.

In the newer approach, spectrum is treated as land, which can be split up into parcels and sold or leased. The owner of a piece of land expects to use that land in any legal way that he chooses, as long as he does not interfere with his neighbours.

However, spectrum is not so easily confined or delineated. The attributes and properties of spectrum are largely irreconcilable with the normal concept of property. This is especially clear in the case of spectrum rights in a border area, or spectrum rights to satellite frequencies.

Spectrum users must consider the use of spectrum in adjoining territories before they decide on their own use. No State can rightfully claim to have the full ownership of a satellite frequency, to the same extent as land.

Considerations such as these lead to the inevitable conclusion that spectrum is not "owned" by any State. What the States own is the right to use spectrum in its own territory, within the res-

trictions given by the laws of nature, the treaty obligations in the Radio Regulations and the rightful interests of other countries.

1.1.5 Which rights are transferred in a spectrum licence?

The price paid for a spectrum licence may, as stated in the previous section, be regarded as a rental or as an outright purchase of the State's user rights. The latter notion is logically combined with a right to resell the licence. Any transfer of rights would need to be registered with the spectrum management authorities and the spectrum market would need to be regulated to avoid abuses. Thus, under a market pricing mechanism the market itself would determine the price for traded spectrum rights.

Any discussion of spectrum pricing is likely to raise the question of "privatisation". Any kind of transfer or leasing of spectrum rights can itself be represented as a kind of privatisation but the logic can be taken further with the management of " chunks " of the spectrum being put into private hands. The national authority then acts as a wholesaler, and possibly as a regulator of the kinds of intermediary which would retail spectrum rights to the final users of spectrum.

At present, most frequency licences throughout the world are non-transferable. If the right to transfer the use of sections of spectrum are sold off to private operators, it could hinder the development of international co-operation, as States may no longer control the use of spectrum and thus be unable to enter into international agreements. However, in no case known has a State completely parted with control of the licensed spectrum.

1.1.6 Licence fees

ITU-R and ERC/RR are currently working on the issue of spectrum pricing mechanisms (see [1 and 2]), but to date no legal rule or harmonisation measure has been adopted or proposed.

In the USA, the Federal Communications Commission is given the authority to collect fees, both fees for processing applications and annual regulatory fees. The latter are used to cover the costs of the Commission for enforcement, policy and rulemaking, user information, and international activities. The regulatory fees do not apply to government entities, amateur radio users and non-profit entities. The income from spectrum auctions in the USA [5] is not used by the FCC but is delivered directly to the federal budget.

Within the EU, the Licensing Directive (97/13/EC) provides the common framework used for issuing licences for telecommunications services. An overview of the Licensing Directive is given in Annex I. As regards licence fees and spectrum pricing, the current licensing directive

is not market oriented and indicates that recovery of the administration's management costs should be the basic charging principle.

A possible exception to the administrative cost ceiling is the case of "the optimal use of scarce resources", e.g. spectrum. In this case, limited to individual licences (Art. 11.2 of the Licensing Directive), fees can be higher than mere cost recovering. However, Art. 11.2 establishes the following constraints:

- optimal use should not already be ensured by the burden of administrative costs,
- the spectrum fees may not go higher than that which can ensure an optimal use ("reflect the need"),
- innovation should be fostered, i.e. innovation should not be hampered by fees set too high,
- competition should be fostered, i.e. the pricing system should not result in reduced competition, e.g. by eliminating or hampering the viability of new entrants.

Individual countries in the EU have differing systems for collecting fees. An overview of this can be found in [1]. Auctions have been used in some cases, see [4].

1.2 Other Studies in the area

[1] Draft Report on the introduction of economic criteria in spectrum management and the principles of fees and charging in the CEPT, Document RR(97)135, CEPT/ERC (spring 1998).

[2] Economic aspects of spectrum management, Report SM.2012, ITU-R (1997).

[3] Strategy and policy orientations with regard to the further development of mobile and wireless communications (UMTS), COM(97)513, European Commission (15 Oct. 1997).

[4] Implementing Spectrum Pricing. Consultative document from the UK Radiocommunications Agency (May 1997).

[5] Using market-based spectrum policy to promote the public interest, Rosston & Steinberg, FCC study (Jan. 1977).

[6] Auctions and bidding - a primer. Paul Milgrom, Journal of Economic Prospectives no 3, 1989.

2. OBJECTIVES FOR REGULATION OF SPECTRUM

The purpose of spectrum regulation is to ensure that legitimate users of the radio spectrum obtain the maximum benefit from it without causing disturbing interference to other legitimate users.

One of the purposes of the licence is to grant a specific right for using the radio spectrum to the holder, but it also places specific obligations on that holder. Obligations for cellular operators may include maximum transmitter powers (to reduce interference and EMC problems), and sometimes requirements on the location of base stations. They may also include the requirement to provide radio coverage for a certain percentage of the population in a defined timeframe. Reference to a particular radio standard to be used (e.g. GSM or UMTS as defined by ETSI) can also be included.

The ultimate goals of issuing licences for radio services should be to facilitate access to the radio spectrum, of the appropriate quality, for the widest range of services, while promoting the creation of wealth, competition, and choice. In the particular case of UMTS, it is to help deliver the benefits of the coming wireless broadband multimedia services to the general public.

3. CURRENT AND PROPOSED USES OF LICENSING CHARGES

3.1 Covering the spectrum management costs

The issue and use of a spectrum licence is generally accompanied by a fee. The traditional rationale for the setting of licence fees is to cover expenses within the administration. Such expenses can be not only costs for personnel and accommodation but also such things as training, international co-ordination, general studies and research.

Licensing is, however, only one aspect of managing the spectrum, and it cannot function effectively without the support of other spectrum management activities such as overall frequency planning and co-ordination and monitoring.

The funding of all these activities can be based on either national budget financing or spectrum usage fees, or a combination of both. In addition to the issuing of licences there are other functions associated with spectrum management activities that may generate income, like type approval, test and certification, inspections and issue of certificates (radio amateurs, maritime examinations).

Providing the resources to perform all of the necessary spectrum management functions need not be confined to the administration. Some administrations are using private sector organisations to support specific spectrum management activities. For example, cellular operators normally undertake the frequency planning for their networks.

In most administrations, the way licence charges are set is strictly regulated. The fee may be applied to some or all radio spectrum users. There are currently in use two forms of spectrum usage fee, simple fee and cost recovery. In practice, cost recovery might be considered as a variant of simple fee where the administration sets the value to cover the costs, but the distinction is made because its structure and operation are heavily influenced by national legislative and constitutional requirements.

3.1.1 Simple fee

The simple fee may be set at the same level for all licences, or it may vary depending on the frequency band and service. The fee does not necessarily reflect the costs of the administration, so the fees recovered may be greater or less than the administration's costs.

3.1.2 Cost recovery

The cost recovery charges for a radio frequency licence are set according to the costs for issuing the licence and for other necessary spectrum management functions. The exact definition and operation of cost recovery varies according to national spectrum management,

legislative and constitutional requirements. These differences may have an impact on the implementation of cost recovery in each country and affect how the costs and fees are justified. Differences between administrations are particularly evident in the division between direct and indirect costs, and the types of costs permitted for inclusion as a basis for fee calculation.

At the moment in most European countries the licence holders of public and private radio systems contribute to the costs of spectrum management, although this may not be the case in those countries where the public network operator or broadcaster is a government entity. Where government spectrum users and broadcasters are charged, they do not usually contribute in a comparable way with other spectrum users for the spectrum they occupy. Indeed in many countries government spectrum users do not make any payment for the spectrum they use.

Furthermore, the transmission capacity of broadcasters will be used increasingly for telecommunications purposes, and conversely, telecommunication networks (e.g. UMTS networks) will be used for broadcasting or for relaying broadcast contents to telecommunication subscribers. Since both types of networks will gradually convey overlapping contents, they will compete in overlapping markets. Hence, they should be subject to equal financial treatment as regards frequency use, and there is a growing feeling that charge-free spectrum for broadcasters is unfair.

This is precisely one of the points which should be taken into account in the debate triggered by the Commission's Green paper on convergence between telecommunications, IT and audio-visual sectors.

3.1.3 Raising the value of spectrum

A higher level of spectrum licensing fees can be motivated by a desire to raise the value and promote optimum use of spectrum. Income raised could be used to support the costs of refarming and relocation arising from changes of spectrum use. It could also be used for research and software development to improve the spectrum efficiency.

The rate of spectrum refarming has increased substantially as private players intensify their use of spectrum and technologies change faster and faster. Traditionally, a spectrum user is forced by authorities to move to other frequencies and invest in new equipment without special compensation. New players have seldom been asked to compensate the former spectrum users as the situation can be viewed as circumstances for which they are not responsible. This has led to the idea of having the whole community of spectrum users bear the burden, with a refarming fund managed by the State, i.e. an additional charge levied by the State through spectrum fees.

Some countries require the new spectrum users to reimburse the old users of a particular frequency band in cases where the band is needed for new purposes. However, this may be

decided on the merits of individual cases, and care must be taken that spectrum is released and relocation costs are levied in accordance with a reasonable profitability for the new spectrum users.

3.2 Use of spectrum pricing as an incentive for efficient use

The development of new wireless applications has for some frequency bands in some geographical areas resulted in a demand for spectrum that exceeds the available supply. Administrations have developed new economic methods to complement traditional methods for spectrum management. This leads to the notion of "spectrum management by pricing" where the justification of pricing is also the optimisation of spectrum use. Spectrum pricing can thus, in principle, be considered as a tool for improving efficient use.

In theory, any level of spectrum charging that is not insignificant may be an incentive for the licensee, considering its business case, to limit its demand for spectrum and accordingly to use the spectrum more efficiently. However, the financial pressure of spectrum fees becomes an incentive only if an efficient use effectively reduces financial pressure. The conditions to be met in the practical case for the operators are:

- When applying for a licence, the operator should be free to determine the amount of spectrum needed, and the price should increase with an increasing amount of spectrum. Fixed amounts and fixed prices do not give any incentive.

- When using the spectrum, the operator should be allowed to relinquish spectrum and have its spectrum fees reduced as a result. Otherwise, the spectrum fee does not give any incentive to an efficient use.

- The operator must have the possibility of improving efficiency by making investments in the network.

High up-front fees do not push operators to obtain better efficiency, since whatever they do, the initial financial burden will remain unchanged. Such charges may, however, reduce the numbers of people using the services in this spectrum, because in order to recover the high up-front fees the operator may be forced to set high service tariffs. The net result could be that the spectrum is under-used

It is clear that the use of economic methods is not simply a matter of increasing the price charged for a licence, and does not guarantee that the spectrum is used efficiently. Additionally, the most appropriate spectrum for price inelastic services, e.g. for social use, may become unavailable and the use of sub-optimal spectrum may for technical reasons

raise the cost of provision too high.

Optimal spectrum management cannot be achieved if financial pressure, in the form of annual charges, is not applied to the licensees until the end of their licence period. Mechanisms such as one-off payments that are made at the time the licence is issued (e.g. in many cases of auctions, see section 3.3) could lead to a situation where operators "freeze" their frequencies until the end of their licence, even if they stop operating many years before.

Administrative pricing, according to the definition in [1], is a term often used for a charging policy under which the administration applies differentiated fees in order to influence the behaviour of spectrum users. In this approach, licence fees are set at levels that are not dependent on cost-based limitations. The objective of administrative pricing is to make the licensees use the spectrum more efficiently. It may also increase the supply of spectrum by making licensees:

- refrain from asking for more spectrum through use of more spectrally efficient equipment,
- hand back spectrum they do not need,
- move to a less congested part of the spectrum.

Administrative pricing may therefore also provide a mechanism to support a policy on spectrum refarming.

The licence fee is developed from a formula that may include a number of criteria such as:

- frequency band,
- bandwidth used,
- exclusive or shared use,
- geographical location,
- coverage,
- trunking,
- relative congestion.

In practice, a combination of criteria is used, in order to achieve a system that is fair, proportionate and transparent.

In certain cases, administrative pricing may not be a necessary or appropriate tool to ensure the optimal use of spectrum because scarcity of spectrum and the highly competitive nature of the industry, among other things, already forces the players to use resources efficiently. The merit of administrative pricing mechanisms could also be diminished if only a few players bear the burden.

As was mentioned in section 3.1.2, it would distort competition if the telecommunication operators were the only spectrum users subject to licence and spectrum pricing, while others with commercial operations (e.g. broadcasting operators) were allowed to make

profits from their spectrum without being charged.

The convergence between telecommunication and broadcasting services, as is anticipated today, will lead to a more intensive use of spectrum and should be accompanied by implementation of the same pricing principles. The introduction of third generation systems, which provide an example of such convergence, should facilitate this development.

Administrative pricing cannot ensure that non-commercial users of spectrum adhere to the same principles of efficiency as the commercial users. Even if administrations use administrative pricing, they have to find means to make the non-commercial users adopt the most spectrum-efficient technology available and make appropriate investments in their systems to avoid waste of valuable spectrum resources.

3.3 Use of spectrum pricing as an instrument of selection

Since the number of potential licensees becomes smaller as the cost of spectrum increases, this can be used as an instrument for selecting licensees in situations where frequencies are scarce.

In discussing selection, it is important to distinguish between qualification criteria and selection criteria. Usually the administration sets criteria that form the entrance conditions applicants have to meet to take part in the selection. These criteria are called qualification criteria. Selection criteria are used to determine the winner of a licence.

Traditionally, the principle First come, first served is the most widespread and longstanding method. In principle, applications are dealt with in the order in which they came in. This approach is appropriate where there is no scarcity of frequencies. Private Mobile Radio (PMR) licences are a typical example. A large number of such spectrum users, who are not commercial operators and who in consequence do not compete among each other in the telecommunications service, obtain licences if the qualification criteria imposed by the NRA are met.

Comparative bidding, sometimes called a beauty-contest, has as its goal the selection of the best applicant, according to pre-defined selection criteria. Economic factors are often among the qualification criteria, but such criteria are seldom exclusively used for selection. This method enables the pursuit of telecommunications policy goals and implies a thorough and systematic comparison of candidates. The downside is the risk of a complex and time-consuming procedure, subject to litigation.

Lottery is seldom used in Europe, but has been used in the US. With this method, all interested parties that fulfil the qualification criteria (if any), can apply for a part of the available spectrum. The award of the licence is not subject to a selection based on technical or economic criteria.

The advantage of the lottery approach is that, for the administration, it is a quick, simple and non-discriminatory method. The disadvantage is that there is no guarantee that it will result in choosing the most efficient operator, especially if the qualification criteria do not impose a high level of performance or there are difficulties in pre-determining the relevant performance criteria, as may be the case with third generation systems. Moreover, this method can lead to speculation if resale of the licence is allowed.

Auction, sometimes called competitive bidding, is a method where, among all candidates who fulfil the qualification criteria, the one making the highest bid is awarded the licence. The price of spectrum is determined by market expectations. Market theory predicts that auctions will allocate spectrum to those that value it the most and thus will make the most cost-efficient use of the spectrum. However, this does not necessarily mean that the spectrum will be used efficiently from the end-user's perspective.

Auctions resolve some of the problems identified with other procedures such as comparative bidding, if the auctions meet certain preconditions. They must however be prepared carefully in order to create a positive result, and this is time consuming and resource intensive. A survey of the characteristics of different auction types can be found in [6].

As in the case of a lottery, the effect of auctioning on frequency efficiency and development of the mobile market is also influenced by whether the licences are delivered on a transferable or a non-transferable basis and whether they are for a specified use or not.

One of the preconditions for auctions to function properly is that all potential players are fully informed. However, full information, in the context of UMTS, is not yet available, particularly with regard to spectrum availability, market demand and standards to be deployed.

A major risk with auctions is that the charges may become excessive, as will be further discussed in chapter 6. Auctions will probably increase the difference between what different players have to pay for spectrum for the same service, and what different services have to pay for the same amount of spectrum. This will introduce market distortions.

Auctions are therefore not a universal solution to all licensing problems and are not suitable for certain types of licences. For example, problems may occur when different uses compete for a licence, e.g. broadcasting, scientific applications, civil defence use and other non-commercial uses.

Auctions can also not be used when different radiocommunications services share the same frequency band. Bidders' valuations will be discrete at a point in time. Such valuations may change due to new circumstances not predicted at the time of auction. It is hence vital that some mechanism is put in place to re-assign spectrum.

3.4 Use of spectrum pricing as an instrument of taxation

When the charging level becomes high, there may be more fees generated than can be spent on frequency-spectrum related matters. This amount should then be considered as a spectrum tax, not a charge.

Typical of a tax is that it is a monetary contribution to government funds without any direct service in return. A charge on the other hand is a monetary contribution paid for a specific service or performance by a government or a governmental agency. An imposed monetary contribution to government funds without a direct service in return can however also be considered as a charge, where the charge is used to fulfil a regulatory purpose with an indirect coupling to a service, such as spectrum management.

Using spectrum pricing for taxation may be more or less intended from the beginning. Some auctions have to a large extent been used as an instrument of taxation. Experience shows that once an element of taxation has been introduced, it is later hard to eliminate it.

The decision of the State to increase the charging level through spectrum pricing will have an impact on telecommunication market growth. Operators that are assigned spectrum will pass most of the costs on to the consumers and keep their profit level more or less constant.

Since it is well known that there is a close relationship between tariff levels and the growth of a wireless service, it is important for the State to consider to what extent the amount of taxation has a direct impact on the telecommunication market growth, and hence on the growth of the State's total economy. If charges are too high initially, it may damage the future base for value-added tax and other forms of income.

4. SITUATIONS WHERE LICENCE CHARGING IS DIFFICULT

4.1 General

There are some spectrum uses for which charging seems impracticable or impossible. For example there would be no mechanism for charging for unlicensed use of spectrum, such as wireless PABX or cordless telephones. Charging is however not necessarily impossible where, for historical reasons, certain kinds of services that have been funded entirely or in part by the State, are exempted from charging. For certain non-profitable services of general interest, charging seems politically and socially difficult to accept. However, as have been pointed out before, terrestrial broadcasting should have the same charging rules as competing telecommunication services at a time when the broadcasting and telecommunication services are converging.

The economic viability of totally new systems such as UMTS are extremely sensitive to high costs in the beginning of their build-out. It is impossible in advance to know the number of subscribers and terminals, and how long the spectrum will be used, or indeed what constitutes sufficient spectrum for viability. A high initial financial charge could be expected to hinder the full development of these systems.

4.2 Satellite services

The mobile satellite component plays an important role in the universal delivery of third generation wireless multimedia services, because satellite and terrestrial components are viewed as complementary, each covering areas which would be uneconomic for the other to reach.

Similar principles of spectrum pricing should be applied as well to satellite operators, taking into appropriate consideration the differences in system and market compared with terrestrial mobile operators.

The most important difference is that operation of satellite systems has a global aspect that is very important. Normally, the space segment is authorised by only one administration that notifies the ITU and leads the co-ordination. However, the other parts of a satellite system – the gateways, service providers and subscriber terminals – will normally require authorisation or license exemptions in each country. While terrestrial component operators may pay for spectrum on a country-by country basis, this is not likely to be the case for the satellite component.

The following two aspects concerning fees and charges for satellite licences should be distinguished:

• The simple covering of administrative expenses incurred for awarding a licence: in this case the costs are objective and justifiable and it is a right of the administration to choose a mechanism, as fair and transparent as possible, to charge the licensee in order to finance its costs related to the issuing of a licence;

• The fees to be paid for the use of the spectrum: a major point is that it will be a disadvantage for satellite operators, at least at the start of the service, to have to pay fees at the same level as terrestrial operators, in numerous countries, for the use of the spectrum. The total of all these national fees could be very high.

Furthermore, it should also be taken into account that a fee to be paid for the use of the spectrum could lead to non-harmonised use of it. However, should a fee mechanism for the use of the spectrum by satellites be established, it should at least be created only after the completion of the process of harmonisation of the use of the frequency bands.

Finally, auctions as a selection mechanism for granting spectrum licences for satellites are not feasible and should be strongly discouraged. The electromagnetic emissions from satellite services do not respect geographical boundaries, so to be able to operate satisfactorily a satellite system have to acquire the same frequencies in all countries covered by the satellite.

Separate spectrum auctions in these countries cannot achieve that. Indeed, this selection method applied to satellite systems may lead to negative effects such as the fragmentation of the band for revenue-generating reasons, the non-harmonised use of the spectrum, problems with roaming and high prices for operators and for consumers.

5. THE BUSINESS CASE FOR THE OPERATOR

A simple model has been used in order to study what effects the licence fees could have on an operators' profitability, and consequently on the end-user market. The model examines different licence fee scenarios, including an initial fee such as might result from an auction, and very high annual fees for the right to use radio frequencies.

The model is based on the UMTS Forum Report "A Regulatory Framework of UMTS" and studies made in connection with the business plan for GPRS and available information within Telia and Unisource. While the Forum's Regulatory Report gave some indications of the impact of increased investment costs and reduced subscriber revenue, this model evaluates the impact of licensing charges.

5.1 Assumptions

The model is a country with 15 million inhabitants and an already established GSM market. A licence fee of 10 or 50 USD per capita has been assumed. A price of 10 USD per capita corresponds to a representative level for a second operator's licence for GSM1800 in a western European country, and 50 USD per capita corresponds to a level reached in the US PCS C-block auctions.

The case with a annual fee, the total of which over 15 years would correspond to the one-time initial licence fee of 50 USD per capita, i.e. 50/15 USD per capita has also been evaluated.

The internal rate of interest may be interpreted as the average yield over the period. For comparison the interest calculated for costing purposes should be taken into consideration; for a mobile service this interest should be 15 - 20 %. An investment is profitable as long as the internal rate of interest is higher than the interest calculated for costing purposes.

Break even, i.e. when the accumulated revenues exceed the accumulated costs, should be reached within three to four years.

5.2 Results

The table below shows the effect from the assumed licence fees on the internal rate of interest over the period 2002 - 2012 and on the time to reach break-even. It should be noted

that the base case with virtually no licence fee is not very firm, however the effects on the internal rate and the delay on break-even will be as shown.

	Virtually no licence fee	Licence fee 10 USD	Licence fee 50 USD	Annual fee50/15 USD
Internal rate of interest	24 %	17 %	5 %	12 %
Break even	2007	2008	2011	2009

From the table it can be observed that the internal rate of interest may only exceed the interest calculated for costing purposes for licence fees in the lower range considered, and that with the assumed annual fee the service may not be profitable. Break even will be reached only after six or nine years for the two fee levels studied, which is a deterioration of one or four years from the case with virtually no licence fee.

5.3 Conclusions

With the assumptions in this study, when the fees to obtain a licence exceed the administrative costs, (e.g. where there is an auction, or excessive annual fees for the right to use radio frequencies), it will have a negative effect on the development of a UMTS service. The results show that the profitability will be reduced, and this deterioration is particularly marked when the licence fee is at a level of 50 USD per capita.

Looking at annual fees instead of an initial licence fee similar consequences can be seen. The internal rate of interest will decline, and break-even will be pushed forwards in time.

From the table it may seem that an annual fee would be advantageous in relation to a one-time licence fee of the same accumulated amount. However, it should be taken into account that a licence in many cases is valid for 15 years, whereas the model is only applied for a ten-year period.

If liquidity is a constraint for an operator, annual fees may be preferable since the operator in that case can distribute payments over the period and escape large up-front payments.

5.4 Further considerations

There are obviously extreme difficulties in estimating the UMTS market. There are great uncertainties. One is that UMTS will be operated in a highly competitive environment, not only

in the form of competition between UMTS operators but also competition between UMTS services on the one hand and other multimedia and broadband services using alternative infrastructures.

Some of the alternative services may be favoured by differences in how licence fees are applied by the authorities in some countries, e.g. the earlier mentioned example of services using digital broadcasting techniques.

The competition will therefore put UMTS operators under very high pressure to apply minimal tariff levels when they market their services to end-users. This factor may mean that the assumptions used in this study are too optimistic in estimating profitability. With lower incomes for operators the pressure on profits caused by licence fees will obviously be stronger than indicated in the table.

6. Impacts on society

The UMTS market is in its early stages of development. If the industry is to be afforded an opportunity to blossom into a fully competitive marketplace, with all of the attendant benefits that are brought about by competition, it is essential to provide potential UMTS operators with sufficient certainty to encourage and promote their investment in this developing technology.

In particular, UMTS operators must have certainty regarding the costs of access to UMTS spectrum – the lifeblood of any UMTS system.

Because the UMTS market is in a very early stage of development and very sensitive to price, regulatory requirements regarding UMTS spectrum allocation and pricing should be structured to encourage investment in UMTS systems and thus the development of this nascent industry.

Despite the initial attraction of auctions or other substantial up-front licence charges (collectively "up-front licence charges"), as a means of allocating and pricing UMTS spectrum, high up-front licence charges are not the right tool to achieve these goals.

Up-front licence charges increase tariffs for consumers, slow the development of innovative services and therefore potentially harm competition. Rather than use up-front licence charges to allocate UMTS spectrum, other spectrum pricing mechanisms that encourage investment in the UMTS industry should be implemented. Such pricing mechanisms will be more beneficial to consumers and business interests, and therefore also to individual governments.

Auctions in one country will encourage auctions in another country, which increases the risks that the world will become a patchwork of different standards and services in the same frequency bands, which in turn will significantly increase the difficulties of international co-ordination.

If many countries undertake such a selection process, the goal of global roaming will be defeated, as consumers will be able to use their terminals in some countries, but not others. It must be realised that the value of a wireless telecommunications service is far more than the value of the spectrum it occupies. A study by the consultants Nera and Smith estimates the economic impact of using radio spectrum in the UK to be more than 13 billion UKP. These estimates cover only the direct effects on employment and surplus for consumers and companies. The dynamic effects on the economy are also important but harder to estimate. A spectrum pricing policy that hurts the growth potential of the economy will prove to be very unprofitable in the long run.

6.

6.1 The allure of up-front licensing charges as a means of pricing spectrum

As discussed in previous chapters, up-front licensing charges, and particularly auctions, present a number of benefits that, standing alone, appear desirable. For example, high up-front licensing charges can promote efficient use of limited spectrum resources, provide rational and transparent criteria for selection among competing applicants, are administratively simple and obtain economic rent for a scarce public resource.

Such benefits cannot be considered in a vacuum, however. The benefits derived from the use of high up-front licensing charges are necessarily coupled with substantial costs, discussed below. When these costs are weighed against the benefits, it is clear that high up-front licensing charges should not be employed when licensing UMTS spectrum.

The impact of using up-front licensing charges to price spectrum for an emerging service such as UMTS can be analysed by considering the consequences such charges will have on a variety of interests, specifically the UMTS industry, the UMTS consumers, and the governments regulating UMTS.

6.2 The disadvantages of up-front licensing charges for the UMTS industry

The use of high up-front licensing charges will most immediately impact the business environment for UMTS. It cannot be emphasised enough that UMTS is a nascent industry in which investor uncertainty is high and market demand is untested. In such an environment, the threat of high up-front licence charges may significantly depress investment interests and can create undesirable barriers to development.

6.2.1 Investment and infrastructure for UMTS

High up-front licence charges increase investor uncertainty and correspondingly decrease investment in an industry for a new service such as UMTS. As a result, network build-out may be less robust because capital funding that might otherwise have been used for network and service construction has already been spent just to gain access to UMTS spectrum. In addition,

technology choices may be driven by a short-term focus on recovery of up-front fees rather than a long-term focus on over-all growth of the industry. This may have potentially irreversible consequences for service provision.

High up-front charges can be particularly problematic when they are connected with services such as UMTS, for which market demand is uncertain and equipment is not yet available or still in experimental stages. Bankruptcies and reduced investment incentives are the likely outcomes where high spectrum costs cannot quickly be recovered because business is still in the developmental stage. The US experience with interactive video services provides a vivid case in point.

Example: Interactive Video Distribution Systems (IVDS) auctions. In 1991 and 1992, the US Federal Communications Commission received several applications demonstrating an innovative wireless technology that would enable subscribers to interact with broadcast video transmissions. For example, with a click of a remote control button, subscribers could change the camera angle of a televised sporting event, respond to a news survey or order take-out in response to a restaurant advertisement.

A number of interested entrepreneurs formed a trade association, argued for spectrum allocation and publicised their innovative service in the media. As a result, the FCC auctioned off nearly 600 licences – two in each urban regional market, yielding a total of $213,892,275 in auction revenues and spawning 170 new businesses.

Unfortunately, demand for IVDS services has not been established. The IVDS equipment was still in its early experimental stages and was not yet ready for mass production. The growth of wire line alternatives to this wireless service, primarily using the Internet, also took off unexpectedly.

A substantial number of licensees were unable to effectively launch their businesses and simply lost their money. Costly litigation against the government is underway, with applicants seeking relief from auction debt. Services have been delayed. Although the auction was completed in July 1994, end-users have not received the benefit of new services. Accordingly, spectrum that might be more productively used has been under-utilised.

6.2.2 Competitive impact

High up-front licence charges resulting from auctions can distort competition. As mentioned earlier, it would unquestionably be unfair if telecommunications carriers were subject to high spectrum fees, while others (e.g. broadcasting operators) were allowed to offer UMTS or UMTS-like services in existing spectrum without similar fee requirements. This disparity will increase as the convergence between telecommunication and broadcasting services takes place. In such a scenario, auctions are not competition-neutral.

Furthermore, due to the scarcity of the UMTS spectrum, and in accordance with the UMTS Forum calculations of the minimum spectrum needed for each UMTS operator, only 3 or 4

licensees can get a UMTS licence in a given country.

It can be foreseen that the number of bidders may be higher since new entrants will apply for UMTS licences in addition to the operators of second-generation systems. All second-generation operators may not get a UMTS licence. However, it seems likely that the second-generation systems will evolve to offer UMTS-like services. This may be an attractive alternative for operators of second-generation systems, which the current regulatory framework hardly can, or should, try to oppose.

As a consequence, in particular if auctions are employed as a spectrum pricing mechanism, new UMTS operators may be faced with sizeable entrance fees not levied on existing second-generation operators. Since both deliver similar basic services, this may jeopardise the viability of UMTS operators on the nascent multimedia market, thus ultimately depriving the market of the full service capability which only a fully harmonised UMTS will be able to deliver.

Finally, high up-front licence charges may be incompatible with the necessity to maintain the highest level of competition on the mobile communications market. Small and innovative companies tend to be disfavoured by high up-front charges, compared with the situation for big, well-established companies.

The cash-flow generated from UMTS services will be needed to cover investments in the growing network, and interest on the initial investments constitutes a heavy burden. The possibility of transferring costs to later stages in the business cycle is often a prerequisite for such companies.

As shown with the experience of the PCS C-block auctions, a highly attractive market can lead to a situation where new entrants overestimate their ability to balance the funding of licence charges and investments in their network with their expected income.

High charges could undermine a newcomer's viability, when they have to roll out a totally new network starting from zero, while existing operators have the opportunity to reuse their infrastructure. High up-front charges could in the short or medium term cause operators to go bankrupt.

As very few operators may have the "critical size" to maintain their activity on the UMTS market, competition could be seriously compromised.

6.3 The disadvantages of up-front licensing charges for UMTS consumers

Future UMTS consumers will seek access to the best possible UMTS services at the lowest prices. High up-front licence charges will hamper, not promote, both of these objectives.

As discussed above, high up-front licence charges will discourage innovation and infrastructure investment and thus will not facilitate the best services for UMTS consumers.

Without question, high up-front licence fees are a cost that ultimately must be recovered from consumers through higher prices for services. Simply put, the higher the up-front charge, the higher the tariff that must be charged to recover that fee. And in the case of auctions, those up-front charges may be particularly inflated in order to win licence awards. The resulting high tariffs may, in turn, affect consumer take up of the service and ultimately, the success of the industry.

Higher tariffs have a concomitant effect on operators' marketing strategy for new services. High tariffs force operators to focus on high revenue niche markets from which they can quickly recoup high up-front investments such as licence charges. High up-front charges thus discourage operators from taking a long-term view of developing the mass market for UMTS services and inhibit access to such services by a broader segment of the population.

Experience with wireless communication networks shows that coverage is what end-users value most highly. As has been discussed, high up-front charges tend to discourage operators from building out their networks. If the operator has been selected through an auction process, the regulator may have refrained from prescribing any coverage obligations in order to get the maximum revenue from the auction. In such circumstances, consumers are faced with an under-developed service.

6.4 The disadvantages of up-front licensing charges for governments

In the licensing and pricing of UMTS spectrum, governments seek to encourage innovative and efficient spectrum usage, and ensure the maximum economic return for the government in the long term.

As has already been discussed, high up-front licensing charges are not the best means to achieve these goals. On the contrary, the high market value of spectrum should be an incentive for governments to find more spectrum and thereby increase the value of the services for the consumers.

In due time the governments have to allocate more spectrum for UMTS services to allow the operators to serve more customers. The efficiency of spectrum use will then be an important parameter for determining which operators should get an additional allocation.

6.4.1 Innovative and efficient spectrum usage

Among the goals of spectrum management are for governments to ensure that licensees develop their services quickly and utilise scarce spectrum resources in the most efficient manner.

While high up-front licence charges may be one method of achieving these goals, other methods, such as strict build-out requirements and coverage commitments can accomplish them as well – and without the detrimental impacts that are associated with high up-front fees.

In addition, up-front investments that are channelled not to spectrum access, but instead to extensive coverage, marketing programs, high quality systems, robust networks and employee training will result in more effective use of the spectrum than government fees.

6.4.2 Resource compensation

A government's spectrum management goals also include obtaining a fair value for spectrum licences in order to recover the costs associated with the government's spectrum management functions and/or to generally raise revenue for the government.

High up-front fees may meet a government's revenue raising goal in the short term. However, as mentioned in section 3.4, when viewed as part of a longer-term scenario, such fees may in fact result in lower revenue raising potential. Also, the long-term growth of the telecommunication industry is slowed down, resulting in lower employment and unnecessary government expenditure for unemployment.

As discussed above, when companies are forced to pay high up-front fees for a service with as-yet unproved market demand and experimental equipment, it can lead to business failures and bankruptcies – as was the case for IVDS services in the US. In such circumstances, not only will a government be denied the tax revenues that are generated from successful businesses, but the government may also not even receive the up-front licence fee.

In addition, where service definitions have not been established and economies of scale in equipment markets have yet to be attained – as is the case for UMTS – auctions may not prove to be the revenue raising tool that some governments hope them to be. Again, an example from the US auction experience proves instructive.

Example: Wireless Communications Services (WCS) auctions. In April 1997, the US Federal Communications Commission concluded an auction for a number of licences in various service areas at 2.3 GHz. The auction raised only $13 million, with some licences selling for as little as $1. These licences failed to attract investment in part because no particular service or business plan had been brought to the FCC, and none appeared to be identified other than "advanced wireless services."

Multiple services were permitted in the spectrum, which reduced spectrum value for all

services. The fragmented market also made higher equipment costs likely because of the lack of any economies of scale available to manufacturers. Finally, a market demand for any spectrum applications was highly uncertain, suggesting a lengthy development period. Indeed, to date, no business plan for the use of this spectrum has been firmly established. The use of auctions in this context has not raised the expected revenue for the US government.

Rather than look to high up-front fees to raise revenue, a government's interest in receiving appropriate compensation for public resources may be addressed through secondary benefits that are derived from the development of a new service – higher tax revenues as the service matures and broader economic growth from a more robust telecommunications sector.

Indeed, as the cases of IVDS and WCS spectrum auctions demonstrate, upfront fees may provide less economic rent from spectrum resources than would otherwise be obtained through faster spectrum exploitation. Because high up-front fees can increase prices and reduce demand, licences awarded using other criteria, without financial bids, may generate more taxes from operators and equipment suppliers, create more jobs and increase PSTN interconnection revenue. In the long run, the taxpayer will benefit more by the latter approach.

7. RECOMMENDATIONS

• Spectrum pricing may be used as an incentive for efficient spectrum use, provided that these charges are fair, proportionate, transparent and competition neutral. They should mainly be motivated by cost-recovery and not by maximisation of revenue. The benefits, however, should be carefully weighed against the potential damage on the service.

• When selection of licensees is necessary because of lack of frequencies the administrative comparative approach should be preferred over auctions or lotteries. Auctions lead to high up-front fees, which will increase the tariffs for the consumers, slow down the development of new, innovative services, such as UMTS services, diminish the infrastructure investments and harm competition. Lotteries provide no assurance that a competent operator will be awarded a licence.

• Spectrum pricing as an instrument of taxation must be avoided, as it will have a direct negative impact on the growth of the telecommunications market and the general economy. Such a taxation will in the long run diminish the total income for the State. High market values should be an incentive for regulators to find more spectrum, which will benefit the public more than excessive transfers of money to the public funds.

• Taking into account that the UMTS market is still at a very early stage of development, any regulatory actions regarding UMTS spectrum should be aimed at encouraging investments in UMTS systems. The UMTS business case study indicates that high fees will have a negative impact. Large downpayments at the beginning of the licence period should be avoided, in favour of charges related to the use of the system, like royalty or annual fees.

• Due consideration should be given to the particular global nature of satellite systems when seeking to establish a suitable mechanism for defining licensing costs and spectrum pricing for the UMTS satellite component.

ANNEX I

The EU Licensing Directive

Within the EU the Licensing Directive (97/13/EC) provides the common framework used for issuing licences for telecommunications services. It is primarily the Licensing Directive which is reviewed below, and the order of its articles is followed, although a few references to other directives are occasionally inserted.

Art. 1: Scope

In conjunction with Art. 2 (definitions) of the Interconnection directive, this article establishes that authorisations can be requested in all cases when spectrum is used, even in cases where it is used for private telecommunications or even for purposes that are not always considered as telecommunications (remote control, etc).

However, Art. 1 also states that this directive is not applicable to defence and public policy in general, and the part of security services defined by Treaty articles 36 and 56. Public broadcasting is also excluded but only to the extent that it is covered by other community law, i.e. charging is not necessarily linked to this exception.

Art. 2: Definitions

Two essential requirements related to spectrum are defined in Art. 2:

- "effective use of the frequency spectrum"

- "avoidance of harmful interference between radio-based telecommunications systems and other spaced-based or terrestrial technical systems".

The first of these two spectrum-related essential requirements happens to be precisely the goal often invoked by the market-oriented approach. However, and curiously enough, an "essential requirement" is also defined in the same article as a "non economic reason in the public interest which ...." (same definition as in telecommunication Directives 96/2, 96/19, 97/13, and 97/51).

Therefore this directive includes an "effective use" definition (here meaning the same as "efficient use") which complies with the traditional administrative approach since it considers that "efficient use of spectrum" is among the things that market mechanisms may not always guarantee and which have to be "administratively" imposed.

Since this suggests that this directive follows the traditional approach, there may in fact be a potential for a conflict at some time with the market-led viewpoint in this directive application, but we do not yet know in what provision or circumstances.

Art. 3.2: (in Art. 3 - Principles governing authorisations)
This article states that all licensing conditions, i.e. spectrum pricing conditions included, shall be (a) objectively justified, (b) non-discriminatory, (c) proportionate and (d) transparent. Obligations (a) and (c) seem to impact on spectrum pricing levels, and obligations (b) and (d) should impact on the spectrum pricing procedure (e.g. auctioning).
This article also refers to Art. 4.2 and 4.4 of the Annex:

As any licence provision has to be justified (see (a) above), the directive has an annex providing a limited list of the reasons which can justify a given licence provision. In this annex, Item 4.2 (related to individual licences) the "effective use of spectrum" is mentioned again and also the "efficient management of radio frequencies". The word "management" focuses on efficiency provided by organisations rather than equipment. The organisations concerned by this could be either those granting licences or the licensees. (any clarifying suggestions?).

Item 4.4 states that "efficient use" of spectrum cannot be ensured by "unreasonably short licence duration". This constitutes another economic parameter to be taken into account in the concept of "efficient use" .

Art. 6 Fees and charges for general authorisations procedures
This article states that "...any fees imposed as part of the authorisation procedures seek only to cover the administrative costs incurred in the issue, management, control and enforcement of the applicable general authorisation scheme. Such fees shall be published in an appropriate and sufficiently detailed manner, so as to be readily accessible."

Therefore, in the case of general authorisations the administrative approach (A) is mandatory. If an EU Member State envisages a higher price, e.g. auctioning, it has to go to an individual licence.

Art. 7 Scope (of individual licences)
This article states that individual licences for networks are possible as soon as frequencies are involved and whether the network provides a service to the public or not. Therefore, private networks, or the private part of a network, may be subject to individual licences as long as they use frequencies. In such a case, the fees and charges are submitted to Art. 11 below.

Art. 9 Procedures for the granting of licences
In 9.2 it is stated that where the "beneficiary of an individual licence does not comply with a condition attached to the licence, the national regulatory authority may withdraw, amend or

suspend the individual licence or impose..." ... "specific measures...". Examples may include default of payment or failure to meet network roll-out obligations..

Art. 11 Fees and charges for individual licences
This article first sets out the same administrative approach (A) as in the above Art. 6, but has a second paragraph that, in the case of scarce resources states that "charges which reflect the need to ensure the optimal use of these resources" may be imposed.

Therefore in this case "optimal use" is to be sought, i.e. the level of charging is not supposed to reflect the highest ratio between scarcity itself and the expected financial benefit. The question remains as to what "optimal use" means. Some clarification follows as it is stated that: "Those charges shall be non-discriminatory and take into particular account the need to foster the development of innovative services and competition".

Therefore innovation and competition are components of this "optimal use". For instance, a very high price could be deemed to hamper competition (e.g. if a very dominant player is the only one able to pay for the resource). The same for innovation, for which R&D or expensive advanced equipment are necessary, investment in which could be significantly reduced by high prices.

As regards the administrative approach (A), the costs do not clearly include refarming costs, unless the word "management" can be interpreted broadly in "management of the authorisation scheme" in Art.6, and "management of individual licences" in Art. 11. For such a broad interpretation, "management" would have to encompass the freeing of spectrum and the compensation of expelled spectrum users before allocating the same spectrum to beneficiaries of the authorisation scheme or of individual licences.

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