EUROPEAN COMMISSION
Information Society and Media Directorate-General

Electronic Communications Policy
Radio Spectrum Policy Group
RSPG Secretariat

Brussels, 22 October 2009
DG INFSO/B4/RSPG Secretariat

RSPG09-298

RADIO SPECTRUM POLICY GROUP REPORT ON ASSIGNMENT AND PRICING METHODS

Conclusions

Scope of the Report

1. Spectrum is a finite and valuable natural resource. Furthermore, as a general tendency demand for spectrum is increasing and scarcity therefore has arisen in certain frequency bands and geographical locations. In the case of scarcity, it is suitable to manage spectrum based on its inherent "value", through an appropriate assignment procedure and with correspondingly appropriate pricing.

2. Designing assignment procedures, and also frequency fee/charge systems, largely falls within national competences according to the principles established in the EU Framework Directive currently under review. However, Member States can learn from each other's experience. With this aim in mind, the RSPG decided to create a Working Group to study the practices of Member States, and to identify the main drivers which lie behind their decisions on assignment and pricing issues. This Report is primarily based on answers from RSPG members to a comprehensive questionnaire on national experiences and opinions, -and also on a review of related documents as well as intensive discussions conducted in the Working Group.

3. This Report refers to the broader meaning of assignment, i.e. to provide (assign) a right to use a frequency under a number of conditions. According to this meaning assignment policy includes the authorisation to users of spectrum and the definition of the relevant assignment conditions (such as issuing, renewing, suspending and cancelling licences, and

permitting licence-exempt use if appropriate). This Report discusses the methodology of assignment from the spectrum manager's viewpoint, meanwhile previous Opinions of RSPG on collective and public use of spectrum rather focused on a certain type of user or usage.

The results of the survey have enabled the Working Group to identify some of the main factors to be considered in the course of planning, designing and conducting assignment procedures.

4. Based on the various national experiences, it can be stated that licence exemption may be considered as a "base case" approach, if there is no expected interference problem and if user-individualization/identification is not necessary.

5. In some cases the concepts of "light licensing" and "private commons" can constitute appropriate solutions especially when only the second condition of the previous paragraph is not met. These forms of assignment can retain some control and provide information about actual usage for the spectrum manager.

6. Furthermore, if the user-individualization/identification is necessary and if there is also a potential interference problem, the spectrum manager needs further regulatory tools and the necessity of individual licensing should be examined. If no scarcity in spectrum is foreseen, or scarcity can be managed by another mechanism (e.g. spectrum pricing, releasing more spectrum, secondary trading), the "First Come First Served - FCFS" approach is a simple and administratively straight forward method of individual licence-based assignment.

7. When spectrum scarcity is the key problem, auctions or beauty contests can be organised by national administrations in order to select the most suitable assignees.

8. Auction can be a very effective assignment mechanism when national administrations pursue a simple objective consisting of obtaining the best economic valuation of the spectrum. It supports transparent procedure, provides a clear signal about market value, and, in practice, the result can be less contestable in court.

9. In the case of auctions, the spectrum manager can achieve its non-price preferences via licence conditions and admission criteria. However, spectrum managers should be aware that more and stricter admission criteria and licence conditions would reduce the licenses' flexibility and therefore the valuation by applicants. This will likely result in less intensive competition for spectrum and, eventually, in a lower price offered by applicants. Therefore these two issues, non-price obligations and expected auction results, should be carefully balanced.

10. In spite of its numerous theoretical and practical advantages, the auction method is not a universal panacea. There are concerns, amongst which is the fact that the auction mechanism is very sensitive to problems of competition and it may not be effective when the spectrum management is attempting to achieve too many simultaneous policy goals. As a general lesson from the study on national practices, when undertaking an auction, the preparation period is crucial and rigorous planning necessary with the consideration of all potential outcomes.

11. Employing a “beauty contest” as an assignment method based on multidimensional comparison can be a solution if the spectrum manager wants to pursue several and in some cases non-quantifiable policy goals, which cannot be applied as admission criteria for an auction. In this case it is crucial that the spectrum manager can translate its policy goals into appropriate selection criteria.

12. Beauty contest assignment method may include pricing among the selection criteria and it can therefore be considered as a method allowing valuation of spectrum.

13. The main drawback of a beauty contest is the subjective nature of the process when it comes to evaluating and aggregating different and often hardly quantifiable commitments. Final decisions are therefore frequently challenged in court. Another problem can be that a beauty contest can encourage applicants to offer unnecessary, ineffective and subsequently unenforceable commitments and investments.

In the case of individual licensing spectrum management can also encourage effective and efficient use of spectrum by frequency pricing.

14. According to the Working Group a clear separation between charges (aimed at recovering the cost of spectrum management) and fees (pricing to support spectrum management objectives) not only increases transparency of the financing of spectrum management, but also supports the spectrum management organization to concentrate on its objectives when designing and imposing fees.

15. When determining charges there is no universally accepted method for the allocation of indirect costs. However, creating several homogenous licence categories for calculating average charges can give a cost-effective approximation.

16. The survey has identified the potential elements of a fee formula aiming at efficient and effective use of spectrum. However, no formula, no matter how complex, can take into account all the variations of the marketplace; administrative pricing is therefore only an approximation of the market mechanism.

The field of assignment and pricing, and the direction of change in national practices, may need further investigation.

17. The work carried out in the Working Group drew attention to new fields of assignment where further research and deeper analysis would be useful, for example, the analysis could be extended to include collective and public use of spectrum.

18. With special respect to the rapidly changing technological condition and market landscape, another potential follow up of this work could be to examine the direction of change in national practices in the middle run, compared to the comprehensive picture provided by the current survey.

Introduction

1. Spectrum is a finite and valuable natural resource. Furthermore, as a general tendency demand for spectrum is increasing and scarcity can therefore arise in certain frequency bands and locations. In the case of scarcity, efficient spectrum management should take into account the value of spectrum, including the direct economic value to producers and consumers and the wider social value.

2. This broader concept of spectrum value is crucial in planning and conducting assignment procedures, when spectrum managers select the appropriate applicants for use of scarce frequencies. Effective spectrum management - through the assignment procedure and by appropriate pricing – can ensure that users of spectrum recognise its value.

3. The RSPG decided to set up a Working Group to survey Member States' practices of spectrum assignment and pricing issues in order to identify factors to consider when a Member State designs assignment procedures and pricing systems.

4. Designing assignment procedures and frequency fee systems largely fall within national competences and spectrum management has to take account of national circumstances. Therefore it needs to be highlighted that it is not the intention of this Report to elaborate prescriptive rules or to recommend a single best practice on one issue but rather, where possible, to identify a number of best practices for supporting Member States to learn from each other's experience.

5. This work is not primarily aimed at giving strategic advice to the Commission, but rather at sharing information among Member States of the Group.

Definitions

6. In the field of spectrum management confusion can emerge from the fact that a given term may have different meanings in different disciplines. In order to avoid this kind of confusion it is very important to clarify the definitions of the main terms used in this Report.

7. "Assignment" is a widely applied term for different situations in spectrum management and it is also used to mean different things for spectrum economists and engineers. The relationship between different meanings should be carefully specified for clear understanding.

8. In spectrum management, assignment often means the distribution of a given set of frequency channels among individual radio stations for use. But assignment has a much broader meaning as well: to provide (assign) a right to use a frequency. In this economic sense assignment involves the activity of giving licences for use of a specific frequency and moreover the "permission" or "authorization" for any other form of spectrum use (e.g.: licence exempt use). This broader meaning does not contradict the first one; it rather highlights the economic (transactional) nature of issuing spectrum usage rights.

9. This Report refers to the broader meaning of assignment policy including authorization to use of spectrum, and definition of assignment conditions (e. g. issuing, renewing, suspending and cancelling licences and permitting licence-exempt use if appropriate).

10. In relation to pricing issues this Report applies the definitions of ECC Report (53)[1] as a starting point[2]. It is important to note however that in some countries fees and charges are combined:

> ***„Fees****: price charged by the administration to a licence holder for the grant of rights of use of spectrum, with the aim of achieving certain spectrum management objectives such as to ensure the efficient use of that spectrum. Fees are not primarily intended to cover the costs of the Spectrum Management Organization..."*
>
> ***„Charges****: refers to administrative charges, i.e. price charged by the administration to cover administrative costs incurred in the management, control and enforcement of the authorisation scheme (this may include costs for e.g. international cooperation, harmonisation and standardisation, monitoring and enforcement)."*

Focus of the report

11. The appropriate method of frequency assignment might vary depending on the type of use (collective or exclusive use of spectrum), on the authorisation method (general authorization or individual licensing) and on the type of the users. This Report focuses on the assignment of individual licences to (mainly) commercial users for exclusive usage. Other aspects of frequency assignment are discussed in the following opinions of the RSPG in more detail:

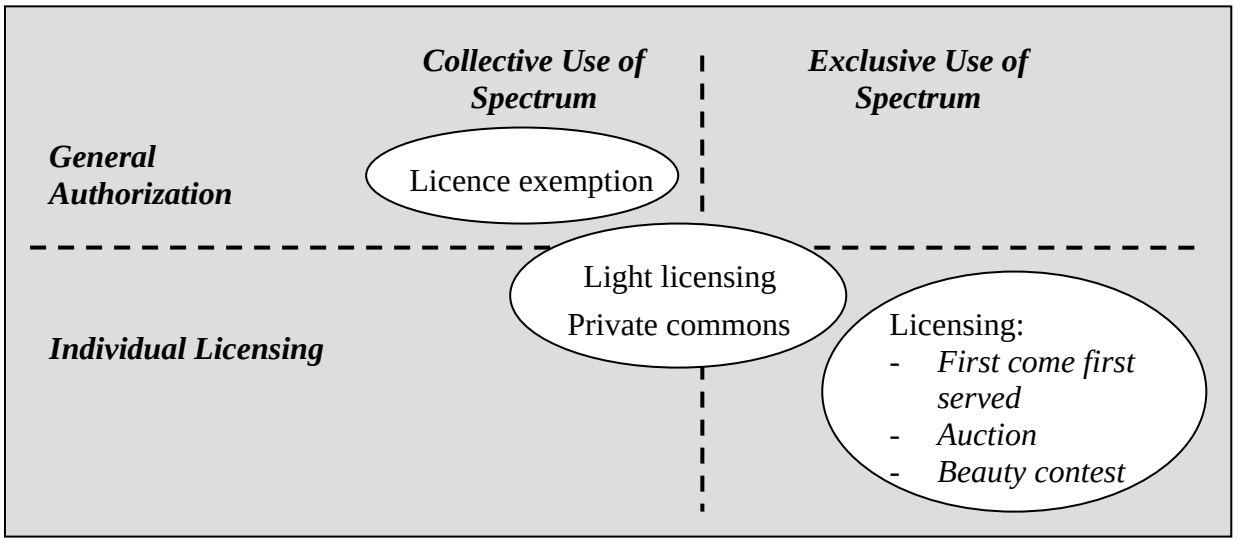
    - The RSPG's Opinion on Collective use of spectrum (CUS model)[3] deals with the field of general authorization/licence exempt assignment.
    - Sometimes it is difficult to make a clear distinction between public and commercial users. Theoretically every assignment method and pricing issue can be applied to both of them. However, public users are in practice often separated from the commercial sector in case of spectrum management. This special field has been treated in the RSPG Opinion on Public use of spectrum.[4]

12. In the first half of 2009 the RSPG Working Group on Assignment and pricing issues has surveyed the practices of the Member States in the related fields. The following sections provide a general picture on assignment and pricing practices and highlight the main lessons from the review.

[1] Cost Allocation and Accounting Systems Used to Finance the Radio Administration in CEPT Countries ECC Report 53
[2] These definitions correspond with the Authorization Directive 2002/20/EC
[3] Opinion on Collective Use of Spectrum; RSPG08-244
[4] Opinion on Best practices regarding the use of spectrum by public sectors; RSPG09-258

Main categories and the background of the assignment

The following table provides a broad categorization of the main approach to assignment models based on two dimensions: (1) how to use the given frequency and (2) how to assign it.



13. This Report concentrates on the second dimension which is about the methodology of the spectrum management's activity:
    - In the case of **general authorization** the spectrum manager opens a frequency band for common use by everybody who meets some general conditions (often related to the authorization of the equipment used). In such a case spectrum management does not provide any protection for a specific user against potential harmful interference come from an authorized use of spectrum Nevertheless, users can claim protection if harmful interference is caused by non-authorized equipment or use. This model is also called "licence exemption".
    - The other model is based on **individual licensing**. In this case the spectrum manager issues a licence to an individual user for the use of a certain frequency band. The licence includes effective guarantees for protection of the licence holder (primary user) against potential harmful interference from other users.

14. The role of the general authorization model is increasing in the field of mass-produced low emission power devices. The technology and business environments are rapidly changing in this field; service and technology neutrality, which is supported by the general authorization model, is one of the answers to this development.

15. General assignments/licence exemption may be considered as a base case scenario. Based on survey results, licence exemption can be an appropriate approach if the following conditions are met:
    - a large number of users in the same area is possible without the need for coordination among the users – in general, congestion is not expected,
    - the given frequency or frequency band is designated for the same use in an extended area (minimum nation wide but pan-European harmonization is more appropriate) – there is no user to which licence exempt use is likely to cause harmful interference in the neighbouring territories,

- no user-individualization/identification is necessary for the frequency management (e. g. subjective requirements to ensure an interference-free spectrum use),
- the general authorisation model is not an option where spectrum is not available in the long-term.

16. If the above mentioned conditions were met but the spectrum manager wanted to maintain some more control over the given frequency band, or needed more information about actual usage, the "light licence" and "private commons" models might be appropriate. The concept of „light licensing" implies some forms of registration or notification for receiving the licence. In the case of "private commons" model a private entity manages interference.

17. If conditions of the general authorization are not met and individual licensing seems to be more appropriate, three main assignment methods have practical relevance:
    a) First come first served mechanism
    b) Auction; price competition
    c) Beauty contest; multidimensional comparison

18. Whichever assignment method is chosen it is important that public consultation be an integral part of the assignment process. On the one hand collecting stakeholders' views may be useful before defining selection criteria and other conditions of the assignment process. On the other hand public consultation is a channel through which stakeholders can be informed about plans of the spectrum management. Accordance with Article 7 of Directive 2002/20/EC (Authorisation Directive) in case spectrum managers wish to limit the access to frequencies, they should allow stakeholders to submit their views.

19. Reference should be made to the link between authorisation issues and implementation obligations assumed by Member States with respect to Commission Decisions relating to electronic communications. It concerns EC Decisions such as 2008/411/EC on the 3.4-3.8 GHz and 2008/477/EC on the 2.5-2.69 GHz bands, where Member States shall designate and make available these bands within a certain period of time after the entry into force of the Decision. As explained in the Commission document *RSCOM08-84 Final*[5], making available a spectrum band means preparing all the necessary steps so that the authorisation process can start and therefore letting potential users know that they will have the possibility to access a frequency band under specific technical conditions.

20. A preliminary demand assessment may also be necessary before choosing the assignment method, if non-scarcity is not obvious or/and there is high economic interest. However, the extent of any work undertaken before an assignment, including any impact assessment, should be proportionate to the benefits of spectrum release.

21. In most countries regulatory activities related to assignment and pricing issues are carried out by more than one player (ministry, authority, agencies). Considering this it is important to have effective coordination throughout the process and to set clear distinction of mandates and tasks.

[5] http://ec.europa.eu/information_society/policy/ecomm/radio_spectrum/_document_storage/rsc/rsc28_public_docs/rscom08-84_implement_back.pdf

First come first served (FCFS)

22. FCFS is the most commonly used assignment method as it is applicable in all bands where no scarcity is observed (e. g. Fixed link, PMR etc.). In this case a spectrum manager issues licences to every applicant (meeting the application criteria).

23. Member States' practices show that FCFS can be an effective assignment method, if
    - low administrative cost[6] and quick result (speed of procedure) are priorities,
    - a large number of candidates with relatively small-scale projects are expected,
    - licences may be assigned for a short duration in time,
    - coordination among licence holders seems to be necessary.

24. FCFS is the simplest and administratively the most straight forward method of licence-based assignment. However, it can only be employed if no scarcity in spectrum is foreseen, or if that scarcity can be managed by another mechanism (e.g. pricing or releasing more spectrums). The following ways can be used to assess whether there is scarcity or not:
    - Spectrum manager can draw a conclusion based on the number of applicants in a given frequency band.
    - Consultation to collect stakeholders' views on how to use the given frequency band in the future. This method may be time consuming and it is not binding on the stakeholders.
    - "Light auctioning": This method is actually a combination of an investigation of frequency scarcity and an assignment method. If the spectrum manager suspects there could be scarcity in a given frequency band, this band could be announced as available (e. g. a web page). Applicants could apply for these frequencies before a given date. The applications have to consist of certain information and a deposit. The application is binding. If the total demand for spectrum exceeds what is available the next step will immediately be an auction. If the total spectrum applied for does not exceed that available spectrum, then the applicants will get the licence on the same principles as if it were the usual FCFS model.

Auctions

25. Conceptually, an auction is a contest for a licence with only one ultimate selecting criterion: the price bid. Before price competition for the licence, however, applicants have to meet some minimum or admission criteria as well. The spectrum manager may also set a reserve price.

26. In the case of auctions the spectrum manager can achieve its non-price preferences via licence conditions or admission criteria. Admission criteria could be interpreted as the "beauty contest like – preliminary" part of the auctioning process. However these obligations would be the same for all the subsequent winning bidders.

27. The key elements which have been used by Member States as license conditions or admission criteria in auctions are:
    - reliability/capability (existence of some experience, ownership transparency),

[6] However costs of planning and registry still exist.

- competition requirements e.g.: the incumbents/existing operators are totally or partially excluded, or there is a spectrum cap i.e. maximum amount of spectrum in one hand is limited,
- prescribing authorisation conditions (e. g.: coverage obligations, wholesale access, such as to MVNOs, 'must-carry' obligation in broadcasting etc.),
- technology or equipment requirements.

28. It is important to be aware that more and stricter admission criteria and licence conditions will reduce the licensees' flexibility to respond to changing consumer demand, technical development and market conditions. It may also reduce competition for spectrum and lower the valuation of spectrum by applicants, which in turn will have a downstream effect on the price offered.

29. Setting a minimum reserve price has several - sometimes contradicting - functions:
    - to avoid an unexpectedly low price,
    - to ensure expected revenue (based on international benchmarks, previous transactions or other signals about market value),
    - to cover administrative costs of the assignment procedure,
    - to discourage frivolous bidders, but at the same time to be attractive for new entrants with viable business plans.

30. Key justifications for choosing auctions as an assignment method are as follows:
    - This approach supports effective resource allocation; based on the principle that spectrum is assigned to players who value it most – i.e. those who are most able to extract value from its use, and therefore have the highest willingness to pay, giving for granted they act rationally.
    - It offers a greater degree of transparency: applicants can be valued and compared on a single quantifiable financial criterion; there is limited room for subjective consideration in the assignment process if admission criteria are properly chosen. The results of the procedure are less contestable in court than in the case of the beauty contest. However, too strict and non-quantifiable admission criteria and licence conditions can eliminate this advantage even if this challenge seems to be easy to cope with.
    - Beyond licence conditions and admission criteria, the auction mechanism cannot involve further restrictions relating to the use of the spectrum (it does not force the applicants into ineffective commitments); therefore it can lead to a flexible use of the scarce resource after assignment.
    - An auction is an effective allocation mechanism especially in the case of a more serious shortage of spectrum: when the expected number of applicants is much larger than the number of licences available as it enables a precise and transparent ranking of applications.
    - It is possible to conduct a relatively fast assignment procedure (although the phase of planning and designing the procedure usually demands significant time and resources).
    - The auction mechanism can provide a clear signal of the market value of the given frequency band that is important information for spectrum management purposes even if revenues are lower than expected.

31. Auctions are certainly not a universal panacea, and Member States signalled a few concerns to be taken into account before choosing this method of assignment:
    - The main drawback could be that the auction mechanism is very sensitive to competition problems. On the one hand the lack of competition is a concern: if there is no real shortage of spectrum - the number of applicants is the same as or less than the number of licences - price competition for the licence can hardly be expected. On the other hand anticompetitive practices should be avoided. Even if there is spectrum shortage it is crucial that the auction is designed to ensure that the bidders are not able to reach price fixing arrangements.
    - It should be accepted by both decision-makers and the public that auctions may not be the most appropriate method to support certain socially desirable services or users.
    - Unintended outcomes and unexpectedly low financial returns often result in criticism of the auction process.
    - Preparation of auction design is a time- and resource-consuming and complicated task. Both auctions and beauty contests need a long preparation period: in the case of auctions it is needed to design the procedure, for beauty contests it is necessary to set the criteria. Neither auction, nor beauty contest is therefore a cost efficient solution in the case of high volume, low value licences.

Beauty contest

32. Beauty contest assignment is a multidimensional comparison during which applicants must submit their proposals for using the identified frequencies. The decision maker then assesses the various applicants' proposals in accordance with several selection criteria. The price bid for the given licence can be one of the selection criteria as well.

33. There are four types of reasons given by Member States in the questionnaire for choosing the beauty contest method:
    a) Enforcement of several different policy goals
    b) Forcing few applicants to compete
    c) Avoiding market failure
    d) Supporting investments

34. The **first** and most important argument in favour of employing the beauty contest as an assignment method is that the inclusion of multiple policy and societal objectives is easier.

35. A related advantage could be that the beauty contest provides information about operators' business plans and expectations which can help in elaborating spectrum management strategy and the dialogue with stakeholders.

36. If the spectrum manager cannot define very simple and quantifiable goals and it cannot translate these goals to admission criteria for an auction, the beauty contest could be a solution. However, the spectrum manager has to be able to translate its specific policy goals into specific selection criteria.

37. The **second** justification is that the beauty contest could be a relevant method when the expected number of competitors is low, and an auction would not be able to generate real price competition.

38. The **third** justification that has been given in favour of a beauty contest is that sometimes it can help to avert the risk of market failure, for example if there are multiple potential co-existent users of a particular spectrum band that would need to co-ordinate together to bid collectively in an auction. An example where this could arise is wireless microphones where it would be unreasonable, due to the transaction costs involved, to expect all the users of wireless microphones to coordinate together to organise a bid for particular spectrum. In such a scenario a beauty contest to identify a single coordinator (i.e. a band manager) may be preferable.

39. The **fourth** frequently-mentioned argument is that in case of a beauty contest the licence price has a lower weight than in the case of auctions and therefore it can allow licence holders to spend more on investments. However, neither does the beauty contest mean automatically to lower licence price nor does lower price automatically mean more money is invested.

40. According to the experience of Member States there are several concerns about beauty contests:
    - The decision making process may not be transparent enough because rating and aggregating different and often hardly quantifiable commitments are necessarily subjective.
    - The results of beauty contests are often heavily criticized by the bidders, different stakeholders and the media. Final decisions are frequently taken to court. This unrest about the outcome of the assignment procedure often results in delay to spectrum assignment, and demands extra resources from the spectrum administration.
    - Both preparation of the rules of a beauty contest (especially the selection criteria and evaluating rules) and the tendering procedure are very complex, resource and time consuming tasks.
    - It is a serious challenge to balance the different criteria properly.
    - It is especially difficult to evaluate proposals with different technologies. Generally the beauty contest assignment method is considered to be less suited to the technology and service neutrality principle.
    - A beauty contest might force applicants to offer unnecessarily high technical and quality commitments to win. Later, it is hard to enforce licence holders' commitments. In some cases the "use it or lose it rule" can be applied. This rule can be important for the credibility of the licence roll out requirements and usage commitment of the winning bids. The application of "use it or lose it" can be substituted by a spectrum value based incentive fee. This rule will only be effective in situations where it is clear that two conditions are met: (1) that spectrum is being held idle; and (2) that such idle holding is inefficient.

41. However, there are also a few potential drawbacks in the case of the „use it or lose it" rule:
    - It may in practice be difficult to define and so detect where spectrum is used or not.
    - Use it or lose it requirements may foster, rather than correct, inefficient spectrum use. In some situations forcing spectrum use might encourage early and inefficient investment in particular services or markets.
    - Use it or lose it conditions may also act as a significant barrier to efficient trading.

42. According to practices of Member States the most frequently used selection criteria in beauty contests are as follows:
    - network deployment speed and coverage,

- quality of services, deployment of advanced technology,
- supporting certain services,
- business plan's content (e.g. retail price, investment) and credibility (track record of the applicants' business activity, management skills),
- prescribing authorisation conditions (e. g.: obligation to participate in rural network development, to host MVNOs, to have 'must-carry' obligation in broadcasting etc.)
- promoting competition,
- financial offer.

Furthermore an assessment of the overall credibility of the offer is often employed.

Charges for recovering costs of spectrum management

43. Spectrum management organizations can impose regular fees and charges on users of spectrum assigned through individual licences. Following the terminology of ECC Report 53, in this current Report charges are levied in order to recover the costs of spectrum management, meanwhile fees are a pricing tool to reach other objectives. However, in practice fees and charges are sometimes not separated clearly.

44. The objectives behind cost recovery charges and incentive fees can sometimes be conflicting. Clear separation of charges from fees not only increases the transparency of the financing of spectrum management but also supports the spectrum manager to concentrate on its objectives when it designs and imposes fees.

45. Charges can be based on the costs of administrative work performed directly or indirectly on an individual licence or the average for that licence category. Allocating of indirect costs to each individual licence can be very complicated and expensive. Creating several homogenous licence categories for calculating average charges can therefore be a cost-effective approximation. There is no universally accepted method for the allocation of indirect costs.

Fees for achieving objectives of the spectrum management

46. There can be two main objectives behind spectrum fees:
    - Extraction of a rent arisen from the private use of a scarce common good. This is only justifiable if there was no price competition for the spectrum usage rights in advance.
    - Fostering and ensuring efficient and effective use of spectrum in a dynamic manner.

47. According to the ITU Handbook National Spectrum Management[7] there are two main models of the spectrum fee design: (1) Incentive fee; and (2) opportunity cost fee.

48. Incentive fee formula consists of relatively few and easily measurable elements. The fee is an indirect approximation of the market value. The fee tries to impact on spectrum users in the following ways:
    - preventing users from stockpiling spectrum that they do not really need (if there is more valuable uses of the given spectrum),

[7] ITU Handbook National Spectrum Management Edition 2005

- encouraging users to use spectrum intensively,
- providing incentives to move to alternative (less congested) frequency bands,
- encouraging users to move to more spectrally efficient equipment.

49. The opportunity cost fee is a calculated value that tries to simulate the market value of the spectrum. It is directly targeting the final goal of value based fee systems: what amount an alternative user would pay. The calculation of opportunity cost requires complicated financial analysis, estimation of demand etc. The opportunity cost fee can be seen as a more sophisticated method to calculate incentive fee.

50. According to the practices of the Member States and the ITU Handbook, the following elements may be included in an incentive fee formula aiming at more efficient and effective spectrum usage:
    - category of the used frequency band (spectrum can be divided into a number of frequency categories according to the level of congestion),
    - bandwidth (for encouraging the deployment of more spectrum-efficient equipment and for encouraging giving up spectrum not needed),
    - coverage area (incentive for releasing spectrum where it is underutilized),
    - population density – congestion (congestion depends on the geographical location, i.e. in rural areas the fee should be lower),
    - exclusive or shared spectrum usage (exclusive band should be more expensive),
    - decreasing fee per number of radio stations in the case of exclusive usage (encourage effective utilization of the given band),
    - increasing fee per number of radio stations and its emission power in the case of shared band (encourage more spectrum-economic use of shared bands)
    - link length and uni-directional or bi-directional links (fixed links)
    - other specific elements: type of the radio trunking, antenna height / diameter, bit rate or capacity etc.

51. In the case of an exclusive right of use in a given spectrum band the deployment of more equipment does not result in less spectrum being available for other users and therefore does not raise the opportunity costs of the given spectrum use. Therefore in exclusively-used bands increasing the fee in accordance with the number of radio stations may discourage effective utilization of the spectrum. This kind of element can become an incentive only in the case of shared bands.

52. It has to be noted that no formula, however complex, can take into account all the variations of the marketplace. All the above mentioned elements are only approximations of the market mechanism.

ANNEX

Summary of responses
RSPG Questionnaire (Work stream on Assignment and Pricing Methods)

Designing assignment procedures, and also frequency fee/charge systems, largely falls within national competences. However, Member States can learn from each other's experience. With this aim in mind, the RSPG decided to create a Working Group to study the practices of Member States, and to identify the main drivers which lie behind their decisions on assignment and pricing issues.
This current document is the summary of the responses from RSPG Members to the Working Group's questionnaire on national experiences and opinions.

Country codes (answering Member States)

AT Austria
BE Belgium
BG Bulgaria
CH Switzerland
CY Cyprus
CZ Czech Republic
DE Germany
DK Denmark
EE Estonia
ES Spain
FI Finland
FR France
HU Hungary
IE Ireland
IT Italy
LT Lithuania
LU Luxembourg
LV Latvia
MT Malta
NL Netherlands
NO Norway
PT Portugal
RO Romania
SE Sweden
SI Slovenia
SK Slovakia
TR Turkey
UK United Kingdom

I. Background of the assignment procedure

1) **Do you conduct research/impact assessment on future demand before frequency assignment?**

    a. **in every case**: DE, FR(via public consultation), IE, NL(demand assessment but impact assessment only in case of main bands), MT, SE, TR
    b. **in case of certain bands**: ES/HU/LT(in case of scarcity), DE(impact assessment only in case of scarcity), EE (bands of high economic interest), RO, SI, UK(if not FCFS)
    c. **only on an ad-hoc basis**: AT, CY, CZ, BG, BE, DK, FI, IT, LU, PT, SK CH, NO,

2) **According to the RSPG Opinion (09-258):**

    According to this recommendation of the RSPG's opinion, is there any "justification procedure" or assessment of the public sector's demand in your country?

    a. **periodically**,

NL (in every 3 years), SE (periodically; negotiations with the Swedish Armed Forces to assess the need for spectrum for military purposes.)

b. **only in case of specific bands**:
ES, FR (Only in case of bands considered in WRC agenda points or in European harmonisation measures and in case of new demand.), MT, PT, RO

c. only in case of new demand
AT, BE, CZ(not obligatory), FI, LT, RO, NO, TR

d. **no, but it is planned** (taking account that the Opinion was recently approved, plans have to be made), LU(under consideration), SK

e. no
BG, DE, DK, EE, HU, IT, SI, CH,
UK (instead AIP and "rights from market" approach)

3) Which institution (Ministry, Authority, Agency, Committee, etc) is to conduct the assessment (justification procedure) of the demand for public and non public use of spectrum?

Ministry	Authority	Agency	Other (or NO)
AT, CY, ES, FI (depends on band), IT, LT, LU, SK	BE, IE, FI, LT, MT, PT, RO, SE, SK, NO, TR	FR, NL, SI	DE, DK, EE(not yet elaborated), HU, (no), UK (each institution identifies own requirement), CH

SE: In cases of disagreement between Authority and the military and police sectors, the Swedish government could potentially intervene.
CH OFCOM: Federal office of communication

4) Which institution (Ministry, Authority, Agency, Committee, etc) is responsible for the

a. decision on initiation of frequency designation procedure:
b. decision on the design of the assignment procedure:
c. conducting the assignment procedure:..
d. decision on the final assignment: …..
e. decision on the pricing principles (fees…)

	Ministry	Authority	Agency	Other
a	AT, CY, DE(allocation table), HU, IT, NL, EE, ES, FI, FR (depends on bands), LU, MT, RO, SI (allocation)	BE, BG, CZ, DE(usage plan), SE, IE, FI, FR(depends on bands), LT, PT, RO, SK, UK, NO, TR	DK, SI (utilization plan)	CH (ComCom-public, Ofcom non-public), BG (Radio Frequency Council)
b	AT, CY, DK, FI(dep. on bands), ES, FR, HU, IT(run the procedure and decide for design details), LU, MT, NL, NO	AT, BG, CZ, DE,FI(dep. on bands), IE, IT (main decisions on assignment procedure), LT, PT, RO, SE, SK, UK, NO, TR	SI (public)	BE (royal decree) CH (ComCom-scarcity, Ofcom non-scarcity), EE, SI (non public)
c	AT, CY, ES, IT, LU, NO	AT, BE, BG, CZ, DE,EE, FI, FR, HU, IE, LT, MT, PT, RO, SE, SK, UK, NO, TR	DK, NL, SI (public)	CH: (ComCom, Ofcom, ministry), SI (non-public)

d	AT, CY, ES, IT, LU, NO	AT, BE, BG, CZ, DE,EE, FI, FR, HU, IE, LT MT, PT, RO, SE, SK, UK, NO, TR	DK, NL, SI (public)	CH: (ComCom, Ofcom, ministry), SI (non-public)
e	AT, CY, CZ, DE, DK, EE, ES, FI, FR, HU, IT, LT, LU, MT, NL, PT, SI, CH, NO,	BG, IE, IT (set criteria in case of selection), RO, SE, SK, UK, NO, TR		BE (Royal decree)

The difference between authority and agency is not clear in every case for example despite the name of the German regulatory authority, which is Federal Network Agency, the institution is still a Federal Authority.

Please specify in your answer if it is different in case of public and non public uses.

AT: in case of the bands of commercial interest: Authority, in case of other bands: local offices of the Ministry
SE: PTS as the regulatory authority is responsible for all the above, except for broadcasting (field of Swedish Radio and TV Authority.
FR: a) A frequency designation procedure can be initiated by the ANFR if it results from a WRC and from a European harmonisation decision (EC or CEPT). This requires the acceptance of the affectataires (sector authorities or ministry departments) concerned. In other cases the procedure is initiated by the affectataires.
IT-Agcom: only for non public use

5) Do you conduct public consultation to assess stakeholders' interest before defining the assignment procedure?

a. in each case
BE, CY, CZ, DE, FR(except for general authorisation), IE, IT, LU, NL, MT, PT, RO, SE, UK(generally), TR

b. **in certain cases**:
AT(commercial use), BG, EE, ES, FI, SI NO,
DK, LT, CH (If it is likely that frequency scarcity can occur),
HU (in case of beauty contest or auction),

c. **so far have not conducted**: SK

WAPECS (as an underlying spectrum management model)

6) Have you applied the WAPECS approach in designation/assignment procedures in the last 5 years?

a. **yes, in case of the following band**(s):

bands	Countries
410-420 MHz	RO, UK
450 MHz	DE, DK(453.0-457.5 MHz/463.0-467.5 MHz), HU, SE,
900, 1800 MHz	DE, DK(872-876 MHz/917-921 MHz), FR, IT, NL, SE,
1452-1492 MHz	UK,
1700-1800 MHz	CY(1790-1800 MHz), IE, UK
UMTS (2,1GHz)	NL,
2 GHz	DE,
2500-2690 MHz	DE, HU, IT (planned), LT, NL, SE, NO
3,4-3,8 GHz	AT, BG (3400-3600) DE, EE, HU/IT/NL/MT(3,5), LT, RO, SE,

26 GHz	HU,
10/28/32/40 GHz	UK

b. **no**: BE, ES, FI, LU, PT, SI, SK, CH, TR

Licence-exempt model (as an underlying spectrum management model)

7) What is your experience with this model?

IE, FI, NL, CH: License exempted radio equipment operates on non-interference**,** non-protected basis and in radio spectrum that is shared with other radio devices.
DE: General assignments (as base case) if:

- no coordination between users required
- nation-wide/national frequency use is possible
- no user-individualization/identification is necessary
- a large number of users in the same region is possible
- the spectrum is available in the long-term

AT: there is no licence exemption even in case of SDR there is general licence
CY, FR: The Licence-exempt model applies for all SRDs, RLAN, RFID, UWB and SRR, in accordance with the EC Decisions.
CZ: SRD, handheld GSM/UMTS or SPCS terminals
UK: easier and faster access to spectrum but less control of interference. It can be expanded into other bands
IT: The first extensive use of license-exempt model for public use (with commercial scope) was with R-LAN at 2.4 (WiFi) and 5 GHz. The regulation was set up in 2003 and is reasonably satisfactory. All range of SRDs normally has been assigned under licence-exempt model.
BE: It is a catalysts for the development of new business initiatives
LT: only for SRD
LU: SRD, 2,4GHz
SE: assessing the need for continued licensing, to ascertain whether the application is a candidate for license exempt use. Examples include land mobile radio for forestry and hunting and certain aeronautical and maritime applications.
DK: No experience. However certain frequency use is exempt from licensing (SRDs, terminals using cellular networks etc.)
MT: Positive experience where bands are harmonised internationally and where there is little risk of harmful interference and no other impediments. It results in lower entry barriers to the spectrum and a lighter administrative burden for users. Exemption from licensing of VHF marine equipment was very positive: considerable increasing in the sales of such equipment to the benefit of the people's safety at sea.
NO: gives easy access to spectrum for users/equipment
TR: Successful regulation by law. These types of devices (IMT devices, SRD devices, wireless microphone systems and DECTs) should not interfere other devices and have to accept interference from other devices.

8) Is there any plan to expand the role of the licence-exempt model (for example applying this model in case of new bands in particular for wireless broadband)?

Because there can be a huge number of examples for licence-exemption (especially in case of SRD, please focus on the most important bands or general strategic goals.)

1. Considered as a base case: DE, FI, NL, UK
2. yes in certain circumstances:
AT, CZ, FR, LT: applies strictly the EC Decisions and the ECC recommendation 70-03.

MT: considering bands listed in Annex A of the Radio Spectrum Policy Group Opinion on Collective Use of Spectrum
BE, CY, ES, IE, IT, LU, SI, CH, TR (in case of needs): to be applied
SE: It is expected that certain applications that are currently licensed will be converted to license exempt use. However, license exemption may not be a primary model.
NO: for bands where little or no coordination between users is needed

3. **Mentioned band**: BE(60 GHz), IE(5,8 GHz-with permitted power and base station registration) LU(5,8GHz),
4. **No plan**: BG, DK, EE(simplified approach for specific bands), RO,

"Use it or loose it" rules as an alternative tool

9) **Do "use it or loose it" rules exist in your practice? If yes, what are the conditions of taking back frequency rights? Is there any experience of actual application of this rule?**

Yes	BG, CY, CZ, ES, FI, LU, MT, NL, PT, SI, SK AT (if it is not in use 12 months after assignment), SE (In practice, it is used sparingly), FR(in case of non public use), DK(can be as licence requirements) IE(extensive use of it), DE(where use of the assigned frequency for the intended purpose has not commenced within one year), IT(often associated with a light coverage requirement plan), LT (if no operation in 3 months per year), CH(the withdrawal without any financial compensation was protected by the highest court), BE(only theoretic possibility)
No	FR(in case of public use), DK(generally), EE, NO, RO, UK(generally), TR
examples	FR(trigger for agreements), DE(1 non-used UMTS licences was revoked the another was returned), IT(UMTS licence), NL(AM radio), MT(two times) LU(some), CH(UMTS, WLL), FI(never enforced),

Renewal of authorisations

10) **Which authorisations are automatically renewed? Which parameters (fees, deployment, price…) can be adapted when an authorisation is renewed?**

1) **automatic**: AT, CY, EE(annually after the paying of state fees), ES, LU, PT,
UK(Licences remain in force for an initial period of a number of years (specified in the auction documentation), and thereafter remain in effect for as long as the licensee wishes, or until Ofcom revokes them under its revocation procedures - normally with five years' notice.),
2) **depends on circumstances**: BE (practically automatic prolongation)SE(presumption of renewal), LT
3) **non automatic except FCFS**: DK, HU, NL(licenses that are scarce can in principle not be renewed. An exception to this rule is that 1) the licence holder has to request a renewal and 2) there have to be significant economic or societal reasons to do so. For any change in parameters, the consent of our minister would be needed and we could charge a fee.),
4) **non automatic**: BG, CZ, DE(only for extra fee), FR, IE, IT, MT, RO, SI, SK, CH, NO, TR

FI: no legal provisions on renewal

In case of unsuccessful procedure

11) **When frequencies haven't been assigned during the first procedure, to which extend are you tied with the first assignment method that was chosen?** Can you imagine new method, criteria, a completely new procedure, new fees?

No determination
BG, CZ, DE, ES, HU, IE, IT, NL, SE, UK, CH, NO
FR:MT: new public consultation
RO: new assignment method or change the initial conditions
Former procedure determine the new one
BE: The changing conditions needs to change the relevant royal decree
FI: The selection criteria and fees are stipulated and are not changed even if a completely new procedure would begin.
CY: A negotiation procedure can be proceeded with the applicants or reduce the number of the individual rights of use to be granted so that it is less than the numbers of the selected applicants and proceed with the auction under the same terms and rules as prescribed in the contest documents or the auction can be cancelled
SI, SK, TR: same procedure, same methods
No experience
AT, CZ, DK, LU: no experience with not assigning frequencies during the first procedure

II. Assignment methods

12) What kind of assignment methods (beauty contest, auction, first come first served, others) have been applied in the last 5 years?

Countries	AT	BE	BG	CY	CZ	DE	DK	EE	ES
Auction	4	0	2	1	0	1	5	1	0
Beauty contest	0	2	0	0	3	2	0	1	3

Countries	FI	FR	HU	IE	IT	LT	LU	NL
Auction	0	0	0	5	3	0	0	4
Beauty contest	2	3	6	1	1	3	3	2

Countries	MT	PT	RO	SI	SE	SK	UK	CH	NO	TR
Auction	1	1	1	0	4	0	10	1	8	1
Beauty contest	2	2	3	3	0	6	1	2	0	0

According to the working group FCFS is an everyday routine.

13) Do you have any publicly available principles (general guidelines) on choosing among assignment methods?

Yes	Auction primary: AT, DE(excepting broadcasting), ES, IE, NL, SE, UK, TR (in case of some bands) No primary: BG, LT, RO, CH, CY, NO
No	BE, CZ, EE, FI, FR, HU, IT, MT, PT, SI

	there is principle	there is no principle
priority to auction (in the case of scarcity)	AT, DE, ES, IE, NL, SE, UK, TR	
no priority	BG, CY, LT, RO, CH, NO	BE, CZ, EE, FI, FR, HU, IT, LT, MT

IT: We deeply justify the choice of any selection procedure in our decisions. These principles are so applied on a case by case basis.

NL: Beauty contests can only be used in circumstances where not all licence conditions can be known in advance of the assignment.

In case of beauty contests (arguments, experience, design, plans)

14) **In which bands have you applied beauty contest in the last 5 years?**

AT, IT, NL: in case of broadcasting
EE: 453,000-457,475/463,000-467,475 MHz
MT: 3,5 GHz
PT: UHF, 450-470MHz
UK: Propose to apply for programme-makers and special-events organisers (PMSE). Adopted in recognition that these users would find it difficult to coordinate a bid for access to spectrum at auction and the consequent high risk of market failure.

There is a large overlap with answers to question 12. However some messages were received:

DE: Very complex in preparation and accomplishment challenge: balancing of the criteria
IE: It may be important the introduction of performance bonds to prevent hoarding and strict enforcement of UIOLI rules and the revocation of performance bonds
LT: results took a case to court in most of the cases
MT: Appeal by one of the unsuccessful applicants. One selected licence holder failed to rollout its network
SK: time-proven method, the process provided by law

15) **What could be the three most important arguments for using beauty contest as an assignment method based on your experience?**

Enforcement of several different policy goals

- easier include policy and societal objectives(HU, IE, IT, MT, CH)
- The wish to have certain coverage, deployment time, quality of services etc. (DK, ES, HU, LT, MT)
- wish to provide certain services (DK, HU, IT)
- Allows imposing strict authorisation conditions, such as obligation to participate in rural coverage, to host MVNOs and must carry obligation (FR, IE, MT)
- Provides the regulator with rich information on operator strategies(FR, MT)
- frequencies intended for broadcasting service (DE)
- Inability to set all licence conditions prior to the assignment procedure (NL)
- Provides for the license authority a broader range for the decision taking process (CH)
- There is a necessity of a complex assessment for issuance of an authorization (BG)
- Technical, economic and effective profit and benefit for the community (SK)
- “Favour the better exploitation of experience”(IT)

Forcing few applicants to compete

- Is the relevant method when the number of expected competitors is low (FR)
- Help new entrants (BE, CH)
- Assignment to more than one operator in one procedure (SI)

Supporting investments

- No price to be paid upfront for licenses(DK)

- Encourage operators to take commitments voluntary offers(coverage, MVNO conditions, QoS) (FR, IE,)
- Supported by radio licence applicants (FI)

Avoiding market failure

- To address particular risks of market failure that might arise if spectrum was auctioned (e.g. inability of multiple likely participants to coordinate a collective bid) (UK)

In the next 4 questions please specify your answers by the relevant bands specified in question 14:

16) What types of 'absolute' excluding criteria were applied?

Excluding criteria	Comments
One licence to newcomer	FR, HU, IE, CH
40% capacity for non-network operator	IT(DTV),
Technology	HU, IE(Only UMTS)
For only current concession holders (incumbents)	CZ, FI, HU
Insolvency or bankruptcy	LT
New comers only	HU, LU, PT, SI,
Owning a frequency licence	RO
Level of coverage	HU, PT
1. Subjective requirements: a) Reliability, b) Capability, c) Specialist knowledge/technical qualification 2. frequency usage concept explaining how they will use the spectrum 3.If it is expected (to prejudice) *to distort* fair competition in the relevant market	DE

No such criteria: ES, MT, SK, UK

17) **What selection criteria were the three most important in the beauty contests** *(e.g. geographic or residential coverage, time of deployment, amount of investment, pledge to apply certain technology, retail price, business plan, references, price offered for the licence, etc.*

List of the mentioned criteria*:*

- deployment speed and geographic/residential coverage (CZ, DE, ES, FI, FR, HU, IE, LT, LU, RO, SI, SK, CH)
- promoting competition(DE,FR, IE, LT(HHI index), LU, CH)
- Business plan:
    - Credibility, experience: FR, IE, IT, LT, NL, UK
    - Main elements (retail price, investments etc.): DE, ES, LT, CH
    - Business and financial plan: MT
- Quality: FI, IE, IT
- Offering MVNO conditions: FR, IE
- Program bid (broadcasting): NL
- bridging the digital divide: FR
- Retail tariff: IE
- Advanced technology: CZ, FI, SK

- financial offer:HU, NL, SI, SK
- consumer benefit: MT

18) What were the weights of the price offered for the licence among the selection criteria?

Band	Weight of the price component (if you could not provide an exact proportion please range its weight on a scale of 1 to 5 where 5 means "decisive" and 1 means "negligible")
FR	1/3
SK	2,5 (10 GHz), 3 (872-876 MHz, 917-921 MHz)
LT	Negligible

DE, FI, LU: (no price component in the beauty contest); assignees have to pay a frequency fee for assignment as laid down in the Frequency Fee Ordinance
CZ, ES, IE, MT, UK, CH: it is not a criterion
HU: different in different procedure (5-90%)
IT: not applicable since it was not used in recent cases.
NL: it is only considered when bidders scored equal on all other selection criteria

19) In which band(s) could the beauty contest be considered as a proposed assignment method in future?

BG: 470-862 MHz
DE, NL: allocated to broadcasting service
DK, IE,: where specific societal concerns
ES, UK: in principle, any
FI, SI: all
FR: 4th UMTS license
LT: 2,5GHz, 2,6GHz, 3,6-3,8GHz
PT: VHF, UHF and L-Bands
RO: UHF, VHF
SK: In the case of limited number of rights for to use frequencies, or for selected frequencies whose conditions is provided in the plan use of the spectrum
CH: when the aim is to promote the entrance of new actors or to foster innovation,
TR: For services that require limited amount of operators, beauty contests might be considered in future.

No: AT, CZ, IT, MT, SE

In case of auctions (arguments, experience, design, plans)

20) In which bands have you applied auction in the last 5 years? General experience (crucial points, lessons learnt, general impression of its effectiveness, etc)

- auctions have been successful and proven an effective method (IE, IT, MT, SE)
- Demand turned out to be well below that was expected (CH), as a consequence revenues were quite low. (NL)
- Unlikely that preferences would be used again as part of the auction process(IE)
- SE: auction design needs to be carefully developed
- DK: 1st price sealed bid chosen because of large bidder asymmetries and to prevent collusion,
- Easy to implement, complex and time consuming in the planning phase (NO)

- DE:
  - Crucial points: long preparation period, transparency and information for applicants before and during the auction, consultation of the draft decisions concerning the detailed definitions and rules for assigning the spectrum and the rules of the auction
  - Lessons learnt: the auction should be designed – under consideration of regulatory aims – as much flexible as possible
  - Effectiveness: high

21) What could be the three most important arguments for using auction as an assignment method based on your experience?

- Fast and efficient way of allocation of the licenses (DK, IT, NL, MT, UK, TR)
- A technology neutral use of a band implies flexibility whereas the use of a band is usually subject to restrictions when beauty contests are applied (BE, DK, IE, UK) most liberal (DE)
- Greater degree of objectivity and transparency (BE, CY, EE) in the assignment procedure in comparison to beauty contest (DK, CH) providing legal certainty (IT, SE, CH) non contestable (DE, IE)
- That it reflects the value of the frequency resource in question (BE, DK, CH, TR)
- Spectrum assigned to enterprises who value it most (market determines the price). (CY, DE, IT, MT, NL, SE, TR)
- the amount of the offered auction price is of substantial importance

In the next 4 question please specify your answers by the relevant bands specified in question 20:

22) What types of 'absolute' excluding criteria were applied (*e.g. only to new comers, network operators, certain technology users, etc.)*?

no		DK, MT, PT, UK
yes	Specialist knowledge/technical qualification	CY, DE, DK (fwa, umts), IE, NO
	Subjective: Reliability/capability	DE
	competition	DE
	Only newcomer	IT(in some cases/procedures for part of the band), CY (planning)
	No incumbent	NL
	Experience in the providing of electronic communications services	BG
	Spectrum cap (not real excluding criterion only after a certain spectrum in one hand)	NL, CH, NO

23) What were the main considerations when setting the minimum price (e.g.: covering administrative costs, give indicative information about the supposed market value, ensuring expected revenue etc.)?

- minimum bids have been set as low as possible to encourage new entrants, while at the same time discouraging frivolous bidding (IE, NL, SE, UK, TR)
- cost recovery of the assignment procedure (AT, NL, CH)
- Based on AIP set for other band (IE, IT)
- (minimum) price are set according the expected market valuations (DK, IT, MT)

- price was set in accordance with the reserve price from the previous (3G,) auction (DK,)
- Minimum bid was orientated to the assignment fee (DE)
- Reach to international benchmark (IE, MT)
- sum of the licence fees for the whole duration (CH)
- the minimum price is the minimum expected value of license (CY)
- covering administrative costs, spectrum demand (BG)
- give indicative information about the supposed market value (BG, SK)
- Minimum price is decided on a political level (BE)

24) In which band(s) could auction be considered as a proposed assignment method in future?

DE, DK, SE, NO, TR: all bands if frequency scarcity is foreseen
AT, IE, NL, UK: in principle, any
AT (2,5-2,7GHz), BE (2,6 GHz), BG (2,5 GHz), IT (2,6Ghz)
FR: 3G bands: 800 MHz and 2.6 GHz duplex blocs will be granted together through auction later in 2009. This will be the first experience with auctions in France. + part of frequencies not reserved for new comer in 2,1 GHz band.
CY: 3.4-3.6GHz, 1790-1800MHz, UHF, 3.6-3.8GHz, 2.5GHz
EE: 2500-2690 MHz, 1800 MHz
FI: plan to enact a law to allow the auctioning of the 2,5 GHz
PT: 3.4-3,8GHz
CH: Dig. Dividend, 900-1800-2100MHZ, 2,6GHz

In case of first come first served model (arguments, experience, design, plans)

25) What could be the three most important arguments for using first come first served as an assignment method based on your experience?

First block (condition):

- When the frequency resources are sufficient to cover the interest (no scarcity): AT, BE, CY, CZ, DE, DK, FR, IE, IT, LT, NL, UK, CH
- When coordination between licence holders is necessary: NL
- If there is not high economic interest for the usage of this band: EE
- Where technical possibilities are higher than requested: SI
- Where possibility of interference is not negligible: CY

Second block (transaction cost):

- Low administrative cost: IT, SE, UK
- Administratively straight forward: IE
- can be granted quickly: FI, UK
- method is clear-cut and understood by everyone: ES, FI

Third block (special goal):

- Not rushing candidates to apply immediately, avoiding spectrum hoarding: FR
- Allowing candidates with small-scale projects: FR
- Allow entry in a staggered way: IT
- When the licenses are assigned for a short duration in time: NL
- No need to get some price for the spectrum: LT
- Quick assignment: NO
- All demand can be met by the available spectrum: NO
- Effective planning of the frequency use: NO

Light licensing

26) Is there specific IT system applied to support light licensing? Please describe your system shortly (1-2 paragraphs). (If there is a publicly available more detailed description, please provide the Internet link or send us the document as an attachment to the questionnaire.)

No	AT, BE, CY, DE, DK, EE, ES, FI, FR, IT, LT, LU, MT, RO, SI, SK, CH, NO, TR
Yes	CZ (operated since 1999 - Wireless local information system in the 70 MHz), IE(online registration; 5,8GHz), SE(for maritime VHF licenses), NL(electronic registration form), PT, UK(ship and amateur)

27) What were your main experiences on light licensing?

- CZ: higher growth of market, less administration work
- UK: it is welcomed by users where exemption is not an option
- IE: successful, although there is uncertainty that all users have registered (added link)
- CY: RLAN, maritime, aeronautical
- EE: positive, reduced administrative charges
- TR: provides easy and fast application and the operators are pleased
- No answer: AT, BE, DE, DK, ES, FI, FR, IT, LT, NL, RO, SE, CH,

28) Do you have any plan to apply light licensing in case of new bands?

No	AT, BE, BG, DE, DK, FI, PT, RO, SE
yes	CZ (DVB-T/DVB-H gap filler outdoor applications seem to be candidate for it) FR(under study for GPR/WPR), IT(71-76/81-86 GHz band), NL(DECT Guard band), IE(where supply is below demand and no pressing reasons to apply stricter licensing), ES(GSM on board planes), LT/CH(under consideration), CY, EE (2500-2690 MHz), MT (5,8 GHz), UK(in principle, any), SI, SK, NO, TR (PMR/AMR bands and Radio Link bands)

III. Frequency fee and charge systems

For analytical purposes, our conceptual approach is to distinguish two basic elements of the spectrum fee systems: administrative charge for recovering the cost of administration and fees for giving incentives for more effective spectrum use or for reflecting the economic value of spectrum.

29) What are the main elements of the frequency fee/charge system applied in your country? What are the main goals behind these fee/charge elements (e.g.: contribution to recover the cost of spectrum management, contribution to the budget of the Authority or the Government, giving incentives for more effective usage etc.)?

Country	Name of the fee/charge	Main goal(s) behind it	Comments (please provide a short description on the main characteristics (one-off/recurrent, bases on the usage right/actually using etc.) and relevance of this fee/charge.
AT	Frequency	Administrative fee to	One-time fee, based on the usage (fixed

	Assignment Fee	contribute to recover the cost of spectrum management	links, PMR/PAMR)
	Frequency Utilisation Fee	Usage fee giving incentives for more effective usage	Monthly fee, based on the usage (fixed links, PMR/PAMR)
BE	annual fee for control and supervision	the fee covers the cost the BIPT has for the management of the frequencies and the spectum control and enforcement cost.	recurring fee on a yearly basis
	entrance fee	decisive in an auction	one time fee in order to reflect the market value of the spectrum
BG	Administrative fees		
	fees for use of individually assigned frequency spectrum		The fees collected by the CRC under the Tariff shall be distributed according to the provisions of the Law on Electronic Communications (LEC). The fees for use of individually assigned
CY	Application Fee	Cover initial inputting and handling of the application	For PMR/PAMR and paging systems the application fee is 154 Euro, for radio links and earth satellite stations the application fee is 111 Euro and for radio amateurs the application fee is 51 Euro
	Annual Fee	Annual fee consist of the Issuance fee and the consumption fee: to the contribution to recover the cost of spectrum management and the economic value of the spectrum	The issuance fee is the cost associated with frequency assignments and the consumption fee is the fee charged for the spectrum assigned over the geographical area, using radio horizon. The annual fee can vary from 212 Euros up to 5126 Euros depending on the bandwidth, degree of sharing, scarcity etc.
DE	Fees and Expenses	to recover the administrative costs + to secure optimal and efficient use of spectrum	The Regulatory Authority shall charge fees and expenses for … decisions on the grant of rights of use for frequencies; The fee scales are to be calculated in such a way as to recover the costs incurred by the official acts + that they serve, as a steering mechanism, to secure optimal and efficient use of these commodities. One-off-fee
	Frequency Usage Contribution Charges	To recover administrative costs	The Regulatory Authority shall levy annual contribution charges to recover costs for the management, control and enforcement of general assignments and rights of use for spectrum and orbit usage, in particular for

			1. the planning and further development of frequency usages, including the necessary measurements, tests and compatibility studies to secure efficient and interference-free use of frequencies and 2. international cooperation, harmonisation and standardisation.
DK	Charge	Cover administration costs	
	Fee		It should reflect the relative market value of frequency band. It should also regulate the behaviour of the users. (from 2010)
EE	State fee	1.Contribution to the budget of the Government 2.Giving incentives for more effective usage	
ES			Fees are computed on the basis of the following 5 parameters: C1. Congestion of the specific frequency band C2. Type of service C3. Specific frequency band C4. Technology of network and terminals C5. Economic value of spectrum
FI	Spectrum fee	to recover the cost of spectrum management	Spectrum fee is based on a Decree given by the ministry
FR	Spectrum management fees	Cover the cost of the spectrum-related costs of ARCEP and the spectrum management costs of ANFR	Annual fee applies to all ECS spectrum users, proportionate to the bandwidth and geographical coverage of the authorisation.
	Spectrum usage fees	Reflect economic value, encourage efficient use	This fee applies differently depending on the ECS bands. It is defined according to principles set in a Decree for most bands. The decree states that the fee is based on: bandwidth, authorisation surface, an index of the value of each band. The fee can be modulated in some bands to reflect more efficient use of spectrum or the advantage derived from authorisations that give the user greater freedom (allotments as opposed to assignations).
UK	Administrative cost-based fees	To secure a contribution to Ofcom's costs	Annual fees, or (where the licence is limited to a time shorter than a year) one fee per licence. For light licensing, fees charged every 3

			or 5 years.
	Administered Incentive Pricing (AIP) based fees	To provide a signal to users and potential users about the value of the spectrum and promote spectrum efficiency, innovation and competition	Annual fees
HU	Reservation fee		Usually one-off fee in time of the assignment. In case of beauty contest or auction it is not imposed.
	Usage fee		In the whole duration of the licence.
IE	Spectrum access Fee	Scarcity value	Once off fee that reflects the value paid at auction, over and above the reserve price, which reflects the scarcity value of spectrum – ComReg sets the reserve price, bidders set the scarcity fee.
	Licence Fee	Contribution to recover the cost of spectrum management	Yearly fixed fee to cover the costs of spectrum management – used extensively in first come first served licensing and licences that are renewed yearly.
	Spectrum Fee	Multifunctional	Yearly fixed fee: ▪ Covers cover the costs of spectrum management ▪ Extracts a fair value for the use of a scarce national resource as an incentive to maximise the efficient use of the spectrum.
IT	Administrative charges	Recover of costs of administrations in spectrum management	All these charges are set by the Ministry of Economic Development. They can be made by a one-off fee and/or by recurrent charges. They are also aimed at recovering the expenses incurred for supervision and control.
	Usage fee	Ensure spectrum is used efficiently	In some cases the usage fees can be defined as AIP, yet the fee was not defined using the opportunity cost. The fee system depend heavily on the actual band in consideration (FS, VSAT, SIT, SUT, broadcasting, space services, satellite, S-PCS, SNG, etc.) and on whether the use is commercial (public use) or not (private). In case of auction procedures the winning bid will substitute the usage fee for all the license duration.
LT	Issuance of authorisation	recovers the costs of RRT related to assignment of spectrum	One-off fee should be paid before the authorisation. Depends on the band, service, and whether the beauty contest

		and issuance of authorisation	was applied or not.
	Monitoring of usage and enforcement	recovers the costs of RRT related to monitoring of spectrum	Monthly paid fee mostly depends on the band, service, assigned amount of spectrum, and coverage area
LU	Unique fee	covering costs of managing the assignment process	One –off. This fee is for the time being not applicable to all applications/ networks.
	Spectrum assignment fee	Incentive for not requiring more spectrum than needed	Recurrent fee. This fee applies whether the spectrum is used or not. For the time being this applies only to BWA in the 3.5 GHz band. The intention was to give an incentive to put rapidly into service the spectrum as the holder has a cost, even if the spectrum is not used.
	Spectrum usage fee		Recurrent fee. This fee is based on actual usage by the operator. It may grow or decrease in relation to the development of the network.
MT		Primary objective to promote the optimal use of the spectrum	Via administrative pricing, established reserve price, amount bid at the auction or comparative assessment. The spectrum fee structure for commercial services are assigned via different financial arrangements e.g. a lump sum determined in advance, annual amounts, or annual amounts on the basis of a pre-defined percentage of the turnover.
NL	Bid in an assignment	Find winner	A bid in an auction or beauty contest enables us to find the winner – the licence holder who has the best business case.
	Financial fee	Ensure efficient spectrum use	A financial fee enables us to stimulate efficient use of the spectrum, by charging the 'real market value' of the licence.
	Admin fee	Recover costs of assignment	One-off administration fee to recover costs of issuing a licence.
	Annual charge	Recover enforcement costs	Annual fee to recover enforcement costs of the Agency Telecom.
PT	Rights of use for radio frequencies	Contribution to recover the administrative cost of the Authority (ICP-ANACOM)	One-off fee. Concession of rights of use for radio frequencies
	Use of radio frequencies (spectrum fees)	- Economic value of the spectrum; - Recover the costs associated with spectrum management - Effective spectrum	Recurrent (Annual fee) The following parameters have been considered for inclusion in the spectrum fees: - Frequency band, - Bandwidth,

		use	- Link length, - Number of channels (frequencies), - Dual polarisation on a single channel /hop, - Number of radio stations (transmitters), - Transmitter power, - Exclusive or shared spectrum usage.
SE	Annual fee	Recover agency spectrum management costs	Recurrent charge, based on the estimated agency cost for each license type (e.g. satellite earth station licenses have a high fee, maritime VHF licenses have a low fee).
	Application fee	Recover agency spectrum management costs	One-off charge, based on amount of frequency planning necessary to grant application and issue licence.
SI	frequency fee	contribution to the budget of the Authority	higher frequency – lower price (fixed for broadcasting) wider channel – higher price (fixed for broadcasting) more coverage – higher price for some use (navigation transmitter, aeronautical and maritime services)
	fees for the efficient use of a limited natural resource	contribution to the budget of the State	Market situation
SK	In all cases		Contribution to the budget of the Authority or the Government.
CH	License fee	Some kind of tax for the exclusive use of a public good	The license fee is depending on the assignment procedure a one off fee (auctions) or a recurrent fee (beauty contest or first come first served)
	Administrative Charge	Financing the administrative work related to licensees	For the technical control and the administration of the spectrum we have a recurrent charge. For direct actions we charge by on an hourly basis. Both types of charges are limited by the principles of cost recovery and equivalence. We are not allowed to make any benefit resulting from administrative charges. If this happens, we have to adapt the legal framework.
NO	Administrative charges	Recover the cost of spectrum management (NPT)	Based on the amount of work/cost that the administration has to administrate the particular band, including historical cost such as international planning. The administrative charges are laid down in regulations, and they depend upon the frequency range, service and actual

			bandwidth a licensee has. Charges are not dependant on actual use.
	Spectrum fees	Giving incentives for more effective use	The spectrum fees are payable to the Ministry of Finance (the Treasury)
TR	Bandwidth, frequency band, number of channels	To use spectrum efficiently	
	Location of usage	To use spectrum efficiently	

30) **Do you have any publicly available principles (general guidelines) on designing frequency fee/charge systems?** *(Here we are interested in the underlying principles behind identical fees/charges or the systems, such as AIP, instead of the fees or fee decree itself.)*

No	BE, DE, IE, ES, FI, LT, PT, RO, BG
Yes	AT, DK, FR (decree- more effective use), SE (Fees has historically been based on the number of base station transmitters. It is under review to implement fees directly based on spectrum holdings. However, the sum of charges should not exceed the agency costs for spectrum management.), NL(fees are based on opportunity costs), IT(charges recover costs, fees as AIP), CY (publicly available principles for annual fees), UK(AIP), EE, SI, SK, NO, TR

31) Is there any link between the applied assignment method and the imposed frequency fee/charge? Please give a short summary with examples!

No	BE, DE, DK, EE, FI, HU, LU, MT, RO, SE, SI, SK
Yes	FR(first come first served basis, fee structure is standardised, beauty contest, fees is a criteria), UK(only in case of FCFS and beauty contest users have to pay AIP), LT (in case of beauty contest spectrum users have to pay registration fee) CH(in auction the winners pay the sum of the fees as an one-off fee), CY (within the application of the formula Consumption Fee), PT, TR

- IT: In case of auction, the resulting winning bid (usually one off fee) will be considered the usage fee for all the license duration. However there are cases where the winning bid could be paid in yearly instalments (with an appropriate interest rate). It is important to specify that the possibility to split the payment over annuities is a benefit and the annuities should not be considered as annual usage fees (for example, should the winner decide to give back the license before expiration, it is still liable for all the subsequent annuities).

- NL: assigned through an auction are assumed to have paid the market price. Beauty contest, financial bid as part of the assignment.

32) Can the fees/charges or fee/charge formulas be modified after a successful assignment by the spectrum managers or the government?

No	AT, DK, IE, PT, SK
Yes	DE, FI, LT, NL: The fees/charges are calculated on an expenditure related basis. The annual charges are calculated for each year. BE, HU, FR(modified by decree) BG: The CRC proposes annually to the Council of Ministers to adopt a tariff

	CY: once a year EE: modification of Estonian State Fees Act is needed ES: annually IT: Administrative charges are often updated by Ministry after consultation. Usage fees can be modified but the criteria used are known at the moment of the selection. LU: by modifying the applicable regulation or licence MT: yes, but not in practice RO, SI: in the case of the changes issued by the minister UK: "periodically" – 3 or more years CH: but it has been put to the court NO: administrative charges may be modified TR: depending on the needs, they are modified

Pricing formulas

33) If there are administrative charges (separated fees or fee elements applied to recover costs of spectrum management) what are the parameters/formulas for reflecting this cost?

1. General answer without exact parameter:

FR: Both ARCEP and ANFR were audited on cost structures (2007). These were included in the calculation of the spectrum management tax.
NL/UK: fees based on costs IT: This depends on the actual band it is very complex FI: it is found on the Decree for the different radio equipment, CY: fees based on the number of employees involved, the radio monitoring and the infrastructures used, EE: administrative charges and costs for frequency recourse
LU: by modifying the applicable regulation or licence
SK Fees are fixed in the regulations

2. General parameters were added

AT: (1)Frequency coordination with neighbouring countries to be carried out? (if yes, the frequency assignment fee is doubled). (2)Size of the region for which the assignment is to be made (countrywide, local, other)
DE: Time which was spent for all necessary administrative activities
CH: Bandwidth, geographical coverage or flat rate per license for recurrent charges for the management and technical control of the spectrum
SE: band, bandwidth, population in coverage area
BE: band and the bandwidth (fixed links)
BG: annual control fee, single fee for granting an authorization for use of individually assigned frequency spectrum, single fee for amendment and supplementation of the authorization, single fee for administrative services
SI: higher frequency – lower price (fixed for broadcasting),
wider channel – higher price (fixed for broadcasting)
more coverage – higher price
TR: bandwidth, number of terminals, time of usage, fixed temporary usage fee (annual) and technology

3. Non reflective charge or no answer

HU, IE, PT: no this kind of charge

34) **How does your fee structure provide incentives for users for more effective spectrum usage? Please show the mechanism behind the certain elements leading to more effective spectrum use.** *(For example higher fee in case of lower frequency, exclusive usage, more congested location, etc. can provide incentives for more economic spectrum usage. An example for incentive fees that motivate more intensive utilization of a given band is a decreasing fee per radio station as the number of the stations increases.)*

Mentioned elements:

- Area, population
- Bandwidth
- Higher frequency
- Number of radio stations
- Value of the frequency
- Opportunity cost - congestion
- Technology
- Exclusive or shared spectrum usage
- Emission power

Some examples in details:

AT: The fees for common frequencies are half of the fees for exclusive use. Higher fee in case of lower frequency

DK: The fee depends on the relative value of the frequency band and also takes into account different kind of usage e.g. it differentiates between fixed links and networks.

FR: The standard fee calculation is bw*fb*c*k with:

Bw is representing the bandwidth; fb is reflecting the relative value of different frequency bands; c is representing the area of the authorisation (replaced by the link length for microwave links), and k is representing the estimated value of an average MHz of spectrum.

For microwave links, we also included a factor to specifically reflect efficient use of spectrum: if the link length corresponds to the best use of a given frequency band, the cost is reduced.

For allotted frequencies (delivered over a wide area with no restriction on the number or location of the radio sites) we also include another factor that aims to reflect the advantage gained by the user who has greater flexibility in his deployment.

UK: opportunity cost of the spectrum concerned. So spectrum that can be used by high-value applications is, broadly, charged at higher fee rates than spectrum for which the demand comes from lower-value applications.

Fees for licences typically vary dependent on the number of frequencies assigned in the licence ("bandwidth"); in the case of non-national licences, whether the assignment is in a part of the country where demand for spectrum is high, medium or low; and the forecast coverage of the service, which is generally calculated from the antenna height and power. In addition, Ofcom offers "area-defined" licences for Business Radio applications, which allow licensees to co-ordinate their own transmitters within the authorised area, and which therefore may lead to a fee for multiple transmitters that is lower than if each transmitter had its own technically-assigned licence.

IE: a congestion charge applies to encourage take up of alternative bands for both new and existing licensees

IT: proportionally decreasing fee per number of radio stations and per higher frequency bands.

NL: In a beauty contest, the financial fee can also be applied. Other financial fees that reflect economic value are only needed in case of extensions or licence variations.

FI: dependent on the amount of frequencies used and the coverage area of the network. Also the spectrum fee is higher on the most wanted frequencies (for instance between 28 MHz - 3,1

GHz). Also the use of exclusive bands is more expensive than collective use of frequencies and when the number of terminals in the licence increases the prise per station decreases.
SE: bandwidth, population coverage, more valuable bands carry a larger proportion of management costs
ES: via 5 parameters:

C1. Congestion of the specific frequency band
C2. Type of service
C3. Specific frequency band
C4. Technology of network and terminals
C5. Economic value of spectrum

TR: More bandwidth, number of channels, number of terminals and time of usage require higher fees.

35) Do you reflect the economic value in your fee systems? In what way and in which bands? If your fee reflects opportunity cost of spectrum usage how do you calculate this cost? *(Where necessary please provide the information by relevant band.)*

Generally overlapping with previous section – we highlight only some new messages
FR: The economic value of spectrum has been taken into account in the French fee system for ECS. However it was also necessary to maintain coherence with the previous fee system that was based on different basis.
DE: Calculation of broadcasting fees (for frequency assignment): parameter is the commenced 10 km² theoretical coverage area until 31. December 2005 the frequency usage fee for DVB-T was reduced at 50 % if the licensee returned a license for analogue transmission. After 2005: 25 %. This should give an incentive for network operators to introduce digital transmission technology.
IT: In case of auction the winning bid (that substitutes the annual usage fees) will reflect the economic value of the spectrum by definition
NL: We follow the opportunity cost approach: what alternative costs would a licence holder need to make, if he was denied access to the particular spectrum?
UK: Administered Incentive Pricing approach is intended to signal the value (or "opportunity cost") of the spectrum to licensees. This opportunity cost is estimated both in terms of the existing use, and in terms of the highest value alternative uses that could be made of the frequencies.
CH: a) the frequency range allocated, the class of frequency and the value of the frequencies; b) bandwidth allocated; c) territorial scope; and d) temporal scope.
MT: the fee reflects the economic value in those bands for commercial use
SK: fees can be calculated from the estimated profit for the provision of services
AT, SI: No
TR: the economic value is reflected and the opportunity cost is calculated

36) Do public (governmental) users have to pay any fee/charge for the usage of spectrum?

a. Yes: CZ (except defence), DK(most cases), DE, FI, IE, LU(except national defence and public safety), MT, SE, RO, UK, NO,
b. No: BG, CY, FR, HU, LT, PT, SI, SK, TR
c. Only under specific circumstances: AT, EE, ES (only when the public body receives financial compensation), NL(only the enforcement costs), NO

It is very difficult to define "public users" and there are no common categories in this point of view. Some examples:

IT: Ministry of Defence (Army, Air Force, Navy, State Policy, Fire Brigades, Arma dei Carabinieri and Department of Public Protection) does not pay for the use of spectrum. Other public sectors such as municipalities and local polices have to pay for it
BE: Yes, apart from the military and some other exceptions like the public
CH: a. authorities and public law bodies and establishments of the Confederation, cantons and communes, provided that they use the frequency spectrum exclusively for tasks for which they bear sole responsibility;
b. public transport undertakings;
c. diplomatic representations, permanent missions, consular posts and intergovernmental organisations;
d. private bodies, provided they perform duties of public interest on behalf of the Confederation, cantons or communes.
It has to be noted that these bodies are not waived of the payment of administrative charges!

37) Is there identical fee/charge (formulas) for public and non public users?

a. Yes: AT, CZ, DE, DK-most cases, FI, IE, LU, MT, RO, SI, NO,
b. No: BG, EE, ES, IT, PT, SK, TR, BE: (some cases public users pay lower fee)
c. Only in specific cases…. only the enforcement costs(NL), IT(see above), SE(Lower fee for police and defence but AIP is be analysing in this fields as well), UK (Crown public sector), CH(only admin. charge),
d. No fee/charge for public use: FR, LT