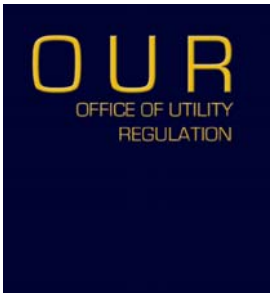

Office of Utility Regulation

Mobile Telephony Licensing in Guernsey

Consultation Paper

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Rev1

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1. Introduction

On 1 October 2001, the States of Guernsey introduced a legislative package for telecommunications designed to:

- ensure that Guernsey consumers receive the best in terms of price, choice and quality of telecommunications services, and
- ensure that the Bailiwick has a vibrant, innovative and sustainable telecommunications sector.

The new legislation created the Office of Utility Regulation ("OUR") and charges the Director General of OUR ("Director General") with a wide range of functions and duties. In carrying out those functions, the Director General wishes to consult with interested parties wherever timescales allow. This paper is one of a number of consultation documents that will be issued to assist the Director General in formulating the regulatory framework. This consultation follows on from the work plan outlined in OUR's Report on the Consultation Paper[1] "Telecommunications in Guernsey Licensing Framework for a Competitive Market" where, with respect to the licensing of mobile operators, reference was made to the development of licence application processes and procedures and competitive processes for new licences in the mobile telecommunications market, including licences to operate 3G systems.

Currently there is only one mobile telephony operator in Guernsey – the incumbent operator Guernsey Telecoms ("GT"). GT operates a GSM system, also known as 2G, using frequency spectrum in the 900 MHz range in accordance with two licences that it holds namely:

- a frequency spectrum licence issued by the Radiocommunications Agency ("RA") in the UK, which authorises GT to use the designated frequencies; and
- its Mobile Telecommunications Licence, issued by OUR on 1st October 2001 which authorises it to provide mobile telecommunications networks and services in the Bailiwick of Guernsey[2].

The drivers of this review of Guernsey's mobile telecommunications sector include:

- The planned liberalisation of the mobile telecommunications market from 1st April 2003 and the need to foster competition within the market in order to maximise the benefits to consumers in terms of prices, innovation and quality of service;
- The need to have a fair and impartial way of deciding who should be allowed to use the frequency spectrum in Guernsey, thus ensuring a level playing field between new entrants and the existing incumbent;
- The need to maximise the efficient use of frequency spectrum in Guernsey as this is a finite and valuable resource in the building of Guernsey's telecommunications sector; and
- A desire to ensure that Guernsey keeps pace with international developments in the use of the frequency spectrum for telecommunications services.

With the changes to the structure of the Guernsey telecommunications market resulting from the Telecommunications (Bailiwick of Guernsey) Law, 2001, and the

[1] OUR Document No OUR 01/12

[2] Prior to this date, GT operated mobile networks and services by virtue of the 1972 Telecommunications Law.

imminent liberalisation of all parts of Guernsey's telecommunications market, the Director General considers it essential to review the licensing of mobile networks and services and the licensing of the use of the frequency spectrum in Guernsey with the focus on how new operators might enter the market in Guernsey. The regulatory regime will need to establish both a level playing field between the incumbent 2G operator and new entrants and also a fair and transparent means of allocating the 3G and remaining 2G spectrum.

The purpose of the consultation paper is to set out the Director General's initial views and proposals on:

- the availability of spectrum for mobile telephony in the Bailiwick of Guernsey;
- options for introducing competition in both network provision and services within the Guernsey telecommunications market; and
- how licences for the spectrum could be allocated.

This document is the first in a series of consultations leading up to the introduction of competition at the end of March 2003 and the Director General seeks the views and opinions of interested parties.

This consultative document does not constitute legal, commercial or technical advice. The Director General is not bound by it. The consultation is without prejudice to the legal position of the Director General or her rights and duties to regulate the market generally.

2. Structure and Comments

2.1. Structure

The rest of this paper is structured as follows:

Section 3: provides background to the relevant legislation and licensing requirements;

Section 4: discusses possible divisions of the available spectrum;

Section 5: presents options for introducing competition into mobile telecommunications markets;

Section 6: applies these options to the Guernsey market;

Section 7: describes alternative methods of allocating spectrum;

Section 8 provides the timetable for the current consultation;

Section 9 summarises the conclusions and questions raised by the paper.

2.2. Comments

Interested parties are invited to submit comments in writing on the matters set out in this paper to the following address:

Office of Utility Regulation
Suites B1& B2
Hirzel Court
St Peter Port
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Email: info@regutil.gg

All comments should be clearly marked "Response to Consultation on Mobile Telephony Licensing in Guernsey" and should arrive before 5pm on 1 February 2002.

All comments are welcome, but it would make the task of analysing responses easier if comments reference the relevant question numbers from this document. The OUR's usual policy with respect to consultation papers[3] is to make responses available for public inspection unless confidential material is put in a separate Annex and clearly marked so that it can be kept confidential. ***However taking into account the nature of this consultation paper, the types of questions it raises and the request for supporting business information from respondents, all responses to this consultation on mobile telephony licensing in Guernsey will be treated confidentially and will not be made available for public inspection.***

The Director General regrets that she is not in a position to respond individually to the responses to this consultation, but she proposes to issue a report on the consultation early in 2002. That report will summarise comments received while protecting the confidentiality of the information submitted.

[3] Set out in Document OUR01/01 – "Regulation in Guernsey, the OUR Approach".

3. Legislation and Licenses

3.1. Introduction

As radio transmissions can traverse great distances and are not constrained by national boundaries, an international regulatory framework has evolved to minimise the risk of interference between individual services using radio spectrum. In most jurisdictions there is effectively a three level regulatory hierarchy, comprising global, regional and national layers. In the case of Guernsey however, there is a fourth or "local" dimension given the special relationship of the Bailiwick with the UK.

3.2. International Legislation

At the international (global) level, the International Telecommunications Union (ITU) issues Radio Regulations (RR) which have the status of treaties once ratified. These set out the broad uses of spectrum that are permitted in different global regions and are updated at World Radiocommunications Conferences (WRCs) which happen every two to three years.

3.3. European Legislation

At the regional (i.e. European) level, two organisations are involved in spectrum management, namely the European Conference of Postal and Telecommunications Administrations (CEPT) and the European Commission (EC). CEPT, formed in 1959, is the regional body of policy-makers and regulators for Europe and currently has a membership of 44 European countries covering almost the entire geographic area of Europe. CEPT's European Radiocommunications Committee (ERC) harmonises the use of spectrum across Europe, where appropriate.

The ERC has five permanent working groups concerned with: frequency management (FM), spectrum engineering (SE), radio regulation (RR), WRC preparation (CPG[4]) and ITU council conference preparation (JWG-ITU[5])[6]. Up until now most aspects of spectrum harmonisation at the European level have been handled by CEPT, but following the publication of a recent green paper on Radio Spectrum Policy, the EC is likely to become more involved in strategic spectrum management decisions. This enhanced role of the EC is reflected in a package of new legislative measures, which are due to be enacted during 2002.

3.4. Wireless Telegraphy Legislation

In issuing spectrum licences in the past, the RA has traditionally treated the Channel Islands as distinct from the UK, even though all spectrum assignments within the Channel Islands are from the UK frequency block. For example, when 3G licences were auctioned in the UK, the scope of the licences did not extend to the Channel Islands. Historically, the RA has responded directly to requests from Jersey Telecoms and Guernsey Telecoms for licences. Going forward a new mobile operator will therefore also need to obtain a frequency spectrum licence from the RA which will

[4] Conference Preparatory Group
[5] ERC / ECTRA (European Committee for Telecommunications Regulatory Affairs) Joint Working Group, ITU Council and Plenipotentiary
[6] In a re-organisation of CEPT it is proposed to merge the ERC and ECTRA into a single committee at the end of 2001

enable the operator to use designated frequencies. Details of the spectrum licence fees charged by the RA are available from the RA's website (www.radio.gov.uk) [7].

3.5. Telecommunications Legislation

Section 2 (1) of the Telecommunications (Bailiwick of Guernsey) Law 2001 describes the Director General's responsibilities regarding the granting of licences for telecommunications networks and services. With regard to the objectives set out in section 2 of the Regulation Law, and subject to the provisions of any States' Directions, the Director General may grant a licence authorising any person to establish, operate and maintain a telecommunications network; or to provide telecommunications services of any class or description specified in the licence.

Section 3 (1) of the Telecommunications Law describes the Director General's responsibilities for publishing details of the procedures to be followed and the criteria to be applied in relation to applications for, and the grant of, a licence. The mobile telephony market in Guernsey will be opened to competition from 1 April 2003. Any new network operator wishing to enter the Guernsey mobile telecommunications market will require a mobile telecommunications licence to do so.

3.6. Conclusions

Mobile telecommunication network operators in the Bailiwick will require both a radio spectrum licence from the RA in the UK and a telecommunications licence from the OUR. Operators wishing to provide mobile telephony services without building or operating networks may only require a licence from the OUR.

[7] Refer to Document RA 2 available from the RA's website.

4. Availability and Division of Spectrum

4.1. Introduction

All mobile network operators that will be licensed will need access to a minimum amount of radio spectrum[8] in order to be able to operate a network. The spectrum available to Guernsey will be a fundamental factor in determining the number of network operators that is technically feasible and hence how the spectrum could be divided. The Director General, therefore needs to identify the spectrum available and consider the minimum spectrum requirements for different types of services.

4.2. Spectrum Availability

4.2.1. IMT-2000 (3G)

The IMT-2000 family of standards is the technical term that includes UMTS (Universal Mobile Telephony Service) or what is commonly known as 3G. The ITU has allocated the frequency bands 1885-2025 MHz and 2110-2200 MHz on a worldwide basis for IMT-2000 which includes a terrestrial component in 1885-1980 MHz and 2110-2170 MHz and a satellite component in 1980-2010 MHz and 2170-2200 MHz.

The IMT-2000 terrestrial components include a natural pairing of two 60 MHz blocks: 1920-1980 MHz paired with 2110-2170 MHz for systems operating in frequency division duplex ("FDD") mode (the core band). The other 50 MHz in the 1885-1920 MHz and 2010-2025 MHz are unpaired spectrum blocks for operating in time division duplex ("TDD") mode. The FDD mode provides efficient operation in many 3G environments providing wide area coverage and full mobility applications. The TDD mode allows operators flexibility in network deployment and to support the predicted traffic asymmetry in an efficient way.

As explained in Section 3 the UK, through the RA, is responsible for negotiating with the administrations of neighbouring countries to agree procedures for the co-ordination between Guernsey mobile systems and the systems licensed by those administrations. For GSM and 3G systems within the Channel Islands these agreements need only be made with the French Administration.

Negotiations are currently underway with the French administration relating to co-ordination requirements for 3G mobile systems. The outcome of these discussions will take the form of a Memorandum of Understanding ("MoU"). The MoU will place restrictions on the permissible field strength at the neighbouring administration's border or coastline due to transmissions from the Channel Islands.

4.2.2. GSM (2G)

France and the UK have already concluded a series of MoUs relating to frequency co-ordination for second generation mobile systems in the bands 890-915 MHz and 935-960 MHz (often referred to as GSM900 bands) and 1710-1785 and 1805-1880 MHz (GSM1800 bands) which is applied in the area including France and the Channel Islands.

[8] A brief introduction to radio spectrum is provided in Annex 1.

The frequency bands 890-915 MHz (mobile transmit) and 935-960 MHz (base transmit) are designated for a pan-European public digital land mobile system, the "Global System for Mobile Communications" (GSM) according to the relevant CEPT Recommendation[9] and EC Directive[10]. The co-ordination procedure is based on the concept of preferential frequencies with the preferred bands being allocated as follows:

- GSM channels: 1 to 38 France
- GSM channels: 39 to 86 Channel Islands
- GSM channels: 87 to 124 France

The UK administration through the RA has licensed one network operator to operate GSM in Jersey and one network operator (GT) to operate GSM in the Bailiwick of Guernsey. The two licences have been allocated the 2 x 25 MHz available spectrum in the 900 MHz frequency range. There are no licensed operators in Guernsey in the 1800 MHz frequency range, although the range is in use in Jersey.

4.3. Division of Spectrum

In Europe, most administrations have already issued licences for both 2G and 3G operators and therefore have already decided on spectrum division in both cases.

In 2G, which is more established, the number of licensees in each territory using the 900 and 1800 MHz ranges varies from 2 to 5. At present the entire 900 MHz range is licensed by the RA to GT. However as there is no usage of the 1800 MHz spectrum in Guernsey, this is available for licensing and should provide sufficient spectrum for a Bailiwick-wide 2G network.

In relation to 3G the licensing authorities in the different international jurisdictions have allocated spectrum frequency in a number of ways[11]. For example, the RA in the UK granted one licence for 2 x 15 MHz paired and 5 MHz unpaired (for a new entrant), one licence for 2 x 15 MHz paired and three licences for 2 x 10 MHz paired plus 5 MHz unpaired spectrum. In France however, the regulatory body licensed four 3G mobile operators each being allocated 2 x 15 MHz paired and 5 MHz unpaired spectrum. In Germany, the regulatory authority made available 2 x 10 MHz paired and 5 MHz unpaired or 2 x 15 MHz paired plus 5 MHz unpaired spectrum.

In summary, the amount of spectrum allocated to each operator by the authorities in various countries is either:

- 2 x 10 MHz paired plus 5 MHz unpaired; or
- 2 x 15 MHz paired; or
- 2 x 15 MHz paired plus 5 MHz unpaired; or
- 2 x 20 MHz paired.

The Office of the Telecommunications Authority (OFTA) in Hong Kong has examined the spectrum requirements for a UMTS system from the perspectives of

[9] T/R 75-02; Athens, 1990
[10] 87/372/EEC
[11] Annex 2 includes a fuller comparison of spectrum allocation practices adopted by the EU Member States.

frequency use, data rate, types of services that can be accommodated and spectral efficiency for each of these allocations and their findings are presented below.

Technical Limitations of Spectrum Allocation per Operator

Criteria	**2 x 5MHz**	**2 x 10 MHz**	**2 x 15 MHz**	**2 x 20 MHz**
Frequency re-use (e.g. impact on network hierarchy)	Hierarchical network design not possible. All data and voice service share same carrier.	2 hierarchical network layers supported. Opportunity to segregate high speed data from low speed services for better system efficiency.	Multiple network layers supported. Opportunity to segregate high speed data from low speed for better system efficiency.	
Data rate (e.g. max data rate supported)	384 kbps for wide area applications. 2 Mbps for one user in indoor environment and not in soft handover.		385 kbps and 2 Mbps for wide area applications.	
Types of services (e.g. high speed data, interactive)	Limited capability in simultaneously supporting multiple voice and data services.	Capable of supporting medium speed multimedia and voice services simultaneously. Limited capability in support high speed multi media services at 2Mbps.	Support high speed data and voice services simultaneously.	
System capacity (e.g. traffic handling capability)	System capacity depends on user mobility, services mix and radio environment, the air interface capacity ranges es m 0.8 – 2Mbps per cell.	1.6 – 4 Mbps per cell	2.4 – 6 Mbps per cell.	3.2- 8 Mbps per cell
Spectral efficiency	For real time high speed data services, the average end user throughput is estimated at 47.7 kbps/MHz/cell.	Additional carrier improves trunking efficiency by 76% to 84.1 kbps/MHz/cell.	Additional carriers improve trunking efficiency by 98% to 94.4 kbps/MHz/cell.	Additional carriers improve trunking efficiency by 124% to 107 kbps/MHz/cell.
Others (e.g. requirements for unpaired block, spectrum sharing)	TDD spectrum allocation would be beneficial to the provision of high speed data.	TDD/FDD partitioning could increase downlink capacity if traffic is highly asymmetrical. For dense urban deployment TDD/FDD partitioning may provide better overall efficiency.		TDD allocation is not needed.

Source: OFTA

4.4. Spectrum in Guernsey

On the basis of an initial assessment of the coordination requirements for 3G this suggests that at least two network operators could be accommodated in the available 3G spectrum in Guernsey. In addition, due to the fact that GSM1800 spectrum is currently unused in the Bailiwick of Guernsey an additional licence for another network operator could be issued in the available 2G spectrum. An example of a possible spectrum package is provided below:

GSM1800	**3G**
2 × 20 MHz	2 × 10 MHz Paired 1 × 5 MHz unpaired
	2 x 10 MHz Paired 1 x 5 MHz unpaired

These three spectrum packages could be allocated in a range of ways – on a stand alone basis, or for example the 2G and 3G spectrum could be combined in some way.

Q4.1 Respondents are invited to submit comments on the appropriate spectrum packages that should be made available within the Guernsey telecommunications market. The Director General would particularly welcome expressions of interest in any particular package of spectrum along with the reasons why that package would be preferred.

5. Options for introducing competition into Mobile Telecommunications Markets

This section sets out some background to the development of mobile telecommunications market generally and provides a context for the discussion of options for introducing competition into the mobile market in Guernsey in section 6.

5.1. Mobile Telecommunications Market and Background Characteristics

5.1.1. The European mobile market(s)

In most European countries, a minimum of two operators offer mobile services using the GSM (2G) technology within the 900 or 1800Mhz spectrum bands. During the past 18 months, most European countries have undertaken a licensing procedure for operators to offer services using the UMTS (3G) technology. The number of 3G licensees varies from two to six across Europe, being a mix of existing 2G license-holders and new market entrants.

The 2G market has been highly lucrative for operators, with mobile penetration levels in Europe varying from 50% to above 70%. The market growth has been almost exclusively through volume, rather than innovation. The focus of innovation in 2G has been on pricing and packaging, not service and technology innovation.

The 3G market is predicated upon the existence of sophisticated services, over and above general mobile voice provision, which customers will value and be willing to pay for. 3G licenses have been awarded based on two separate procedures namely auctions and comparative selection (both of these award procedures will be discussed later in this document).

In the UK, where the first 3G licenses were awarded through an auction process, the most valuable license was auctioned for £4.1bn[12]. The very high prices paid for the initial 3G licenses in the UK and Germany, combined with a growing level of uncertainty regarding the short-term availability of attractive 3G services to support the commercial launch of the 3G interactive broadband services, caused the prices for subsequent licenses to fall considerably and, in certain countries, not enough bidders were forthcoming for the auction based licensing procedure to function.

The current mobile telecommunications market in Europe is thus facing some uncertainty and, whilst 2G services are still profitable, the short-term commercial viability of 3G ventures, where licenses were purchased at extremely high prices, is being questioned.

5.1.2. Regulation and Competition in Mobile markets

Mobile telecommunications markets are characterised by having a relatively small number of infrastructure players, being limited by the need for access to frequency spectrum.

[12] Radiocommunications Agency Press Release 27 April 2000.

Once the available radio frequency spectrum has been exhausted, no more network-based operators can enter the market. It is then important to ascertain whether the small number of players can and will cater adequately for the existing and potential market demand and whether the competitive pressures and tensions between the players is such that they will strive for efficiency and drive innovation to attract customers and provide quality and value for money.

If the conclusion is that the mobile telecommunications market is not sufficiently competitive to ensure the best choice, quality and value for money for customers, then it may be appropriate to consider the introduction of service-based competition, which involves decisions on the levels of access and levels of pricing at which service-based providers should have access to the existing network(s).

Whilst there has been a significant amount of debate at EU and national levels regarding the need to intervene in mobile markets through the introduction of increased service-based competition, only the UK, Denmark, Spain and the Netherlands have taken steps to accommodate service competition beyond straight resale. This has been in the form of indirect (carrier short-code) access or the introduction of MVNO access. Because of the lack of commercial activity to date, it is not possible to evaluate the impact of these regulatory regimes.

5.2. The Benefits of Competition in Mobile Telecommunications

The introduction of competition in general delivers a series of direct and indirect benefits to consumers and the economy alike. The absolute and relative size of such benefits will depend on the specific market conditions and the regulatory framework under which competition is introduced.

Benefits to consumers will generally include a larger selection of higher quality and better priced goods and services. In mobile communications the introduction of competition should bring more targeted services and pricing packages of voice and data services, with improved prospects of innovative mobile communications services in the future.

For the economy in general, a competitive and innovative mobile communications market will be attractive for companies investigating locations for offices and production facilities. This can have substantial secondary impacts on the economy in the shape of increased (or decreased) economic activity, job creation and other associated benefits.

It is generally accepted by policy-makers in developed economies that the provision of telecommunications services benefits from the introduction of competition and this is witnessed by the overall initiatives to introduce competition in telecommunications in Europe, the US, Asia, and increasingly other parts of the world.

5.3. Introducing Network Competition

For the purpose of this paper, the term “network-based operator” refers to an operator that has been licensed to and does use frequency spectrum which is allocated for that operator’s sole use to provide a radio-based mobile telephony network service.

The introduction of network-based competition would enable competition at all levels of the mobile telephony value chain, from network operations to customer provision and management. This can increase the incentives on existing operators to operate more efficiently and to provide more attractive and innovative services to mobile telephone customers, in addition to potential benefits through price and service competition.

However, the setting up of a second and/or third mobile network can require substantial investment and may take some time before having an impact on the market. It is therefore important to consider carefully whether the introduction of more network-based operators will bring the potential benefits to the market within the desired time frame.

A new entrant to the market wishing to become a mobile network operator would need to undertake a number of activities including, for example:

- building a network;
- acquiring a licence to use spectrum;
- obtaining an allocation of mobile numbers;
- undertaking own marketing and signing contracts directly with customers;
- acquiring interconnection agreements with the incumbent mobile and fixed operators; and
- entering into roaming agreements with international operators.

Competition between network operators has been seen to result in a number of benefits including; lower prices for consumers, more variety of and faster innovation in service offerings and increased consumption. It is also considered that it contributes towards greater efficiency in the telecommunications sector, which in turn increases growth and output in other sectors. In other words, there is increased overall GDP growth arising from positive externalities associated with mobile telecommunication networks.

5.3.1. Network Competition in 2G

Subject to the availability of spectrum, it has proven possible to issue more than one licence to infrastructure operator(s) in the majority of countries both within and outside Europe. Considering that 2G has provided the growth-base for the current levels of mobile penetration across Europe and that the business case for 3G is yet to be proven (especially for operators without an existing 2G network and customer-base to leverage), it is desirable to have an efficient and competitive provision base for the 2G services in the first place.

Provision of voice services still constitutes the vast majority of mobile telecommunications revenue opportunities, although data communications, in the form of Short Message Services ("SMS") is a rapidly growing market and revenue stream as well. 2G provides the platform for both of these services.

In addition, the successful launch and operation of 3G services could partially depend on the availability of an existing 2G network and customer-base. The question of whether to license further 2G network operators should therefore not be seen in isolation from the 3G licensing issues.

5.3.2. Network Competition in 3G

Despite the current uncertainties surrounding 3G in the near future, there is broad agreement regarding its overall potential and thus the desirability for operators, customers and national governments alike of facilitating the provision of advanced services through 3G networks.

As described for 2G networks, providing that there is sufficient frequency spectrum available, it is generally considered economically desirable to introduce competition at the network level to encourage efficiency and innovation at this level as well as at the services level. 3G services can be introduced either as an extension of 2G services or as a stand-alone proposition. In most European countries the 3G licenses have been awarded to a mixture of existing 2G license-holders and new 'green-field' operators.

As described earlier, the short-term viability of rolling out 3G networks and services may depend both on access to revenue streams from voice and basic data services in 2G and on the ability to market the existing functionality of 2G services alongside newer 3G services. For example, NTT DoKoMo recently announced plans to incentivise existing 2G customers to migrate to 3G by offering both services together as one, to guarantee geographic (via the 2G network) coverage and provide a transition platform to 3G.

Some European countries have compensated green-field operators, who do not have existing 2G networks in the country where they are seeking a 3G license, by mandating access for these operators to the existing 2G networks operated by their competitors through the provision of 'national roaming'. This approach was taken in the UK, where the green-field operator has just completed its first national roaming agreement with one of the existing 2G operators and is considering entering a second such agreement.

5.4. Introducing Service Competition

Notwithstanding the potential for introduction of competition at the network infrastructure level, there may be a role for competition at the service provision level. Historically, there has been only very limited service competition in mobile telecommunications in Europe comprising essentially of the resale of airtime, with only limited scope for innovation in content and pricing.

Section 5.5 considers the interaction of service competition with network competition whilst this section provides an overview of the various forms that service providers in the mobile market can take. These in turn depend upon the structural and technical form of access used to underpin the service provider's business. The list is not exhaustive, but provides an indication of the types of business models available. Accordingly different legal, technical, economic and commercial issues will arise in relation to each type of access.

For the purpose of this document service-based competition is defined as provision of mobile telecommunications services without having independent access to frequency spectrum.

5.4.1. Service Providers

A service provider is a provider of telecommunication services (or services with a telecommunication service component) to third parties - whether over its own network or otherwise. Service providers can be either Tied (TSPs) who sell branded subscriptions and airtime of their parent company, or Independent (ISPs).

TSPs offer a type of mobile airtime resale by selling branded subscriptions and calls (airtime) of their parent network. The TSP buys the services at wholesale rates and has some freedom to vary packaging and tariffing. The customer's contract is not with the network operator but with the TSP itself, which is responsible for customer service and billing, although as the TSP is tied to one single network operator there is in effect no choice of network on the part of the customer.

ISPs are another category of airtime resellers that are similar to TSPs in that they resell airtime that they purchase wholesale from network operators to their contracted customers. The difference is that ISPs are not tied to individual network providers and can offer a choice between networks. Once again the customer's contract is directly with the ISP itself rather than the mobile network operator, but in this case the customer benefits from the fact that the ISP can choose between network operators.

Service Providers (ISPs and TSPs) make up the most common type of airtime resale services in the European mobile market, delivered either by service arms of the network operator or independent service providers through airtime wholesale and providing tailored billing and tariff packages.

5.4.2. Indirect Access Provision in Mobile

An Indirect Access Provider offers services through a carrier selection code, and the customer accesses the service by dialling this code. The call is originated on a mobile network and routed according to the agreement between the indirect access provider and the mobile network provider. The indirect access provider pays the mobile network operator for the network elements used. This is similar to indirect access over fixed networks. In this business model the customer retains his or her contract for connection to the network (similar to line rental in fixed networks), and has a second contract with the indirect access provider for the call service.

An Indirect Access Provider will need to operate, or have access to, switching network in order to route calls received from the network operator.

The key characteristics that allow indirect access operators to differentiate their service are that they only use the mobile network to originate calls and may use other networks to transit and terminate calls and have the freedom in the packaging and tariffing of services and hence there is scope for introducing new charging models and adding in new value added services.

Indirect access provision in mobile is a relatively new concept. It has only recently been introduced in the UK and hence it is not possible at this stage to assess its impact on the market.

5.4.3. Mobile Virtual Network Operators (MVNOs)

These are players who, while they do not have a network or infrastructure of their own, create a "virtual" network by entering into agreements with network operators (mobile and/or fixed). They then provide a service to customers based on the management of the combination of network elements they have purchased and services or differentiators provided by the MVNO itself. This "virtual network" can be managed by the provider itself or by third parties.

An MVNO in effect purchases the network elements from the mobile network operator, enabling it to provide both connection/rental and call services directly to customers. Customers have only one contract directly with the MVNO who then has full control over the customers' subscription services and call services. An MVNO can provide its own SIM cards and billing and may also provide its own 'Home Location Register' (HLR) systems. This requires a new level of interconnect with the underlying physical network operator, similar to that provided to operators roaming on each others' networks.

MVNOs may be considered to be engaged in a form of 'roaming' because to the network operator, an MVNO's customers look similar to those roaming in from other countries. However, unlike conventional roaming there is not scope for reciprocal agreements because the virtual network does not operate its own access network. The additional freedom that MVNOs have and the full control of the customer provide greater scope for innovation in tariff packaging, billing and introduction of new innovative services.

Competition from MVNOs could offer the same potential benefits to consumers as competition from other mobile network operators (i.e. lower prices, more diversity and a dynamic market), promoting network efficiency-related benefits, as well as promoting economic growth. MVNOs may have an important role to play in developing a market, if it is not feasible for there to be more than one mobile network operator.

The MVNO concept emerged in the European markets during 1999 and 2000, but very little actual activity has happened in this area. This could be related to the slow-down in the industry and the uncertainties relating to the short-term availability of 3G services, as many MVNO ventures have been based on the provision of sophisticated interactive broadband services, as well as general voice services. In any case very few countries in Europe have taken specific action to accommodate MVNOs in their regulatory regime.

5.4.4. Access Conditions

Apart from the different levels of investment and of complexity between network-based and service-based operators, another difference has traditionally been the terms on which they can gain access to other mobile networks.

ISP's have generally been granted access to retail-style services on a 'retail-minus' charging principle where the network operators charge the ISP the relevant retail price minus any avoidable costs caused by the ISP taking only a subset of the service (e.g. ISP's have traditionally done their own customer billing, so this service was not purchased from the network operator).

Network operators, by contrast, generally buy access to network components (rather than retail services or subsets of those) on a 'cost-plus' basis, in accordance with the general European regulation on access to networks. The terms of access for Indirect Access providers and MVNOs, (whether retail minus or cost plus) are not yet clearly defined as these forms of access are both relatively new to mobile markets.

In addition to the different level of charges payable by the different categories of players as described above, the structure of the charges is also different. The retail-minus charges will reflect the retail charging structure of the network operator and give the other player minimum structural pricing flexibility, whereas the cost-plus pricing replicates the network operator's cost base and therefore gives the other player equal structural pricing flexibility to the network operator.

5.5. Co-Existence of Network Competition and Service Competition

Above we have discussed options for introducing competition in mobile markets, through either network-based market entry or service-based market entry or a combination of these. As would be expected, the initial form of competition introduced into a market will cause changes in the market and may therefore influence the attractiveness of the market to subsequent entrants in the same or other categories.

In general, it has been perceived most attractive for network competition to be introduced at the time of initial liberalisation of the market where potential exists for improvements across the board. However, the longer lead-time for network competition to deliver tangible benefits both to customers and the economy may lead to calls for the introduction of service competition to speed this process up.

If service competition is introduced early in the liberalization process this may deliver early price reduction benefits to customers, but may also cause the market to appear less attractive for potential network operators who will need to make substantially larger investments to enter the market. Consequently they may hesitate to do so if the price levels have been reduced by service competition so that the level of return is perceived not to correspond to the risks associated with the investment.

There is very little experience of the tensions between service-based and network-based competition in mobile markets as all European mobile markets have been opened up to network-based competition in the first instance with ISP-based service competition as the only other form of activity.

In fixed markets the experience is much richer. For example, the UK initially introduced competition through network-based competition only, but then introduced service competition when the pace of change was perceived to be too slow. In the Netherlands and in Ireland, no preference was made in the regulatory framework and both service and network competition were introduced at approximately the same time, with both of these markets functioning well and delivering tangible benefits to consumers and the relevant economies alike.

While these experiences may suggest that the perceived tension between service and network competition is larger than the real effects care must be taken when applying

these observations to the mobile market which may have different characteristics and pressures.

5.6. Conclusion

This section has briefly examined developments in mobile telecommunications markets generally and outlined the various mechanisms used in those markets to facilitate and introduce competition. Those mechanisms include:

- Licensing of one or more new 2G network operators;
- Developing licensing and access regimes to facilitated the introduction of service based competition into the 2G market via;
    - Service provision;
    - Indirect Access; and
    - MVNOs.
- Licensing of one or more 3G network operators
    - with/without service-based competition; and
    - with/without mandated 2G ‘national roaming.

The next section goes on to consider these various mechanisms in the context of the Guernsey mobile telecommunications market.

6. Introducing Competition into Guernsey's Mobile Telecommunications Market

6.1. The Guernsey Mobile Market

GT is currently the sole mobile telephony operator in Guernsey and at the end of 2000 had 21,885 mobile customers[13] , 34% of the Bailiwick's population of 64,080. Since then GT state that nearly half of Guernsey has a mobile phone and the company expects mobile penetration to reach 70% within two to three years[14].

Whilst Guernsey's current mobile penetration rate is relatively low compared with many Western European economies there is scope for increasing the number of subscribers and the associated revenues.

Although the absolute size of the population will constrain the size, in terms of revenue, of the local mobile telephony market opportunity in Guernsey, it is important to note that the Bailiwick hosts a vibrant internationally focused banking community, generating significant fixed and mobile business opportunities in is own right. It also contributes indirectly through the local support infrastructure for businesses supplying services to the banking sector, including general business services as well as hotels and catering sector. This vibrant banking business sector together with an active tourist industry on the island, attracted 421,000 visitors in 2000[15] including over 50,000 business travellers staying on average 1.9 nights per visit. Guernsey's visitors rely on mobile communications to stay in touch for business as well as personal reasons and represent a significant business opportunity over and above the local population.

Given the importance of telecommunications (fixed and mobile) to the continuing success of Bailiwick's economy and the fact that the introduction of competition has proven internationally to be a successful means in increasing choice and quality as well as improving value for money in telecommunications, the Director General intends to create a regulatory framework which will facilitate the introduction of competition in the Guernsey market also.

To do this the regulatory regime will address the need for a level playing field between GT and any new entrants to the market. Issues to be addressed will include first mover advantage, access to spectrum and numbers, access to land, licence conditions, fees and any other areas where the advantages of the existing operator could cause market distortions.

6.2. Options for Introducing Competition in Infrastructure

Section 5 discussed some potential forms of competition in mobile markets – this section goes on to consider how these different types of competition could be implemented in the Guernsey Mobile Telecommunications Market.

[13] Guernsey Telecoms 2000 Annual Report
[14] Guernsey Telecoms website: www.guernseytelecomslimited.com
[15] States of Guernsey, Advisory and Finance Committee , 2001 Economics & Statistics Review

First, as set out in section 5, international experience demonstrates significant incremental benefits associated with network-based competition including benefits in the areas of network efficiency and innovation, so much so that both EU Member States and most free market economies have taken the route of issuing licences to network operators where there is sufficient frequency spectrum available to do so. The Director General believes that the Guernsey telecommunications market should not restrict the possibility of achieving similar benefits. She therefore proposes that network-based market entry should be an option for new entrants into the Guernsey market and intends to develop a licensing regime to allow network based entry.

6.2.1. 2G Network Competition

In addition to the general benefits of competition, the Director General notes that penetration of 2G services in Guernsey has started later than in other European economies where mobile competition was introduced some time ago. This suggests that the Guernsey mobile market has lagged behind others in terms of development and could benefit particularly from the introduction of 2G competition. In addition, network competition in 2G can facilitate the development of network competition in 3G which is addressed later in this section.

The Director General believes that as frequency spectrum in both the 2G and 3G bands is available in Guernsey, it would be inappropriate to prevent the development of the market by regulatory means. She therefore wishes to investigate the level of interest of entering either or both of the 2G and 3G markets to enable her to make decisions on the development of a licensing regime for network based entry into the Guernsey mobile telecommunications market.

Q6.1 The Director General seeks indications of interest from parties who would wish to enter the Guernsey 2G mobile telecommunications market to build and operate a second mobile transmission network. Respondents are invited to demonstrate their business case for market entry supported by quantitative data which will be kept confidential.

6.2.2. 3G Network Competition

In order to offer its private and business citizens, as well as its visitors, communications services on par with those services available in other developed economies, Guernsey needs to move towards enabling the provision of 3G mobile telecommunications services.

In light of the fact that almost all European countries have completed 3G licensing procedures and therefore are hoping for launch of 3G networks and services in the coming 12 to 24 months, Guernsey will benefit from moving as quickly as possible to initiate the 3G licensing process. The small geographic scale of the Bailiwick could offer an opportunity for Guernsey to ‘catch’ up with some of its European neighbours in the roll-out and launch of 3G services.

Given the fact that no 3G spectrum has been allocated or is being used in the Bailiwick of Guernsey, there is scope for developing a regime that licenses at least two operators (see section 4 on spectrum availability). This allows the possibility of competitive network provision from the commencement of the opening of the market. Subject to consideration of the responses to this consultation, the Director General

considers it is possible to create two spectrum packages and make these available through a licensing procedure to be discussed later in this document.

Q6.2 The Director General invites parties who are interested in the building and operating of 3G licenses in Guernsey to indicate their interest, providing information on the services potential licensees would seek to offer and the anticipated timescales associated with the roll-out and launch of such services.

As discussed in Section 5, and referred to above, the successful launch of a 3G network may be dependent upon access to a 2G network and the associated revenue streams generated by providing 2G services.

There are two ways that new 3G operators can gain access to 2G networks if that is considered necessary;

- New 3G operators could be granted national roaming access to the existing 2G network. (If GT were allocated a 3G license they would have national roaming access to their own network on non-discriminatory terms); or
- New 3G operators could be granted 2G spectrum in order to roll out their own 2G networks. In this latter case, there may be an argument for allowing new 3G operators access to the existing 2G network on a time limited basis while they roll out their own 2G network.

On the one hand, if new 3G operators were also allocated 2G spectrum, the small geographic scope of the Bailiwick might mean that the lead time to building a network would be relatively short, negating the need for roaming access to the GT network. Alternatively, there could be local circumstances that might introduce time delays for the building of network in which case access might be necessary.

Q6.3 Do you believe that new 3G entrants would need either direct access to 2G spectrum or access to the existing 2G network of Guernsey Telecoms? Please explain your reasons with reference to your expression of interest in the market, if any, indicating how your interest would be affected by the various options.

Q6.4 If you believe there is a need for measures to provide for access to existing 2G network facilities for new 3G entrants, do you believe there should be any time limit on such access and, if so, why?

6.3. Options for Introducing Service-based Competition

The impact of network competition cannot be immediate due to the lead times to build the network and may, even in the medium to long term, not provide sufficient competitive pressures to ensure that mobile users and the overall economy of the Bailiwick benefit from the highest quality, most cost effective and innovative mobile telecommunications possible.

The Director General therefore wishes to investigate the potential for introducing service-based competition in Guernsey in parallel with, after, or in advance of, active network-based competition.

As described in Section 5, service-based competition in mobile communications can take many forms. Experience shows that TSPs add very little to the competitive

landscape. Introduction of competition at the retail level through ISPs could be considered as an alternative way of delivering benefits of competition to mobile users. However, where there is only one network operator, as is the case in Guernsey, an ISP has no choice of network and therefore is operating in a very similar way to TSPs. Both TSPs and ISPs simply resell minutes purchased from network operators and as such are not providing a telecommunications service; therefore it is likely that they will not require a telecoms licence.

This leaves Indirect Access Providers and MVNOs as potentially viable options to accelerate and improve the development of choice and value of mobile communications in Guernsey.

6.3.1. Indirect Access Providers

This is a more active and independent version of service competition - which does in fact require access to certain components of telecommunications network, including switching, but not spectrum. As a result it has the potential to deliver pricing benefits and potentially innovation to consumers in the relative short term.

Only few markets have introduced Indirect Access Providers for mobile services, but comparison is difficult as almost all other markets have competitive network provision and some kind of ISP activities already established, and Indirect Access Provision has been evaluated as an incremental competition platform, rather than maybe the initial platform for introduction of service competition.

Given that there is no competition in the Guernsey mobile market at all, Indirect Access Provision could therefore offer an attractive platform or the rapid introduction of competition.

Q6.5 The Director General seeks indications of the level of interest by potential market entrants of offering Indirect Access Services and the extent to which this could be viewed at an entry platform for a new network operator (in 2G or 3G) or as a substitute for operating a network. Respondents are invited to comment on the effect of introducing Indirect Access Services prior to the introduction of network competition.

6.3.2. MVNOs

The status of MVNO is largely undefined and incorporates a range of activities from sophisticated service provision to full-scale operations of a mobile telecommunications business, lacking only the operation of a frequency-based transmission network.

For the purpose of this paper, MVNOs are defined as providers of mobile telecommunications services, needing access to an existing network (in the case of Guernsey this is assumed to be the GT network) using a ‘roaming interface’ rather than a standard interconnection or wholesale interface.

The MVNO proposition would seem to provide many of the benefits generally expected from network-based competition, but without the capital investment and potential delays associated with building a new transmission network. The Director

General is therefore interested in views on the role that MVNOs could play in the Guernsey mobile market.

Q6.6 The Director General invites comments on what shape MVNOs could take in Guernsey (including the outline service portfolio, level of investment by MVNO, and other relevant parameters to describe the opportunity and the operations of the MVNO) and the extent to which MVNO status could be viewed as an entry platform for a new network operator (in 2G or 3G) or as a substitute for operating a network.

6.3.3. Access terms

One determining factor for a market entrant's choice of entry-method may be the terms on which they will be able to access the existing networks (fixed and mobile). The general background and precedents for different types of access terms and conditions for different types of market players is discussed in Section 5.

In Guernsey, the Director General is proposing an approach across fixed and mobile networks which makes network components available on a cost-plus basis without discriminating between different types of players. The purchase of network components is however only possible and useful for operators with the necessary equipment to interface with the network and the technical expertise to operate such an interface. This makes the access to cost-plus pricing contingent upon the technical capabilities of the individual players and their investment in infrastructure, not on a relatively arbitrary categorization of players in the market.

It may be that the level of mark-up the network operators is allowed to make on network components depends on the level of disaggregation of the network components such that some cost-plus access may be similar in charge level to the retail-minus, but the charges should reflect the cost structure of the components purchased and thus giving the operator purchasing the access maximum structural pricing flexibility, encouraging innovation in pricing.

Q6.7 The Director General seeks comments on access charging and on how this would influence the market entry strategy of potential players.

7. Options for Allocating Spectrum

7.1. Introduction

As can be seen from the preceding sections, spectrum is a limited and potentially valuable resource and it is essential that interested parties have an equal opportunity to apply to use the spectrum available and that spectrum is used efficiently so as to enable maximum benefits to be derived from it. As in the UK a telecommunications company using radio frequency spectrum will require both a spectrum licence (from the RA under the Wireless Telegraphy Act) and a telecoms licence (from the OUR). This section sets out some approaches that can be used to ensure that the means of giving out licences that enables the use of spectrum for these purposes is fair and transparent.

Internationally, three main methods of licensing the use of spectrum for telecoms services, namely:

- first come first served;
- comparative selection; and
- auctions.

Each of these options is discussed in turn below whilst Annex 2 summarises the licencing processes adopted in a number of countries were spectrum has already been licensed for mobile telephony uses. The annex shows that whilst the means of allocating 3G licences across the EU has not been uniform there have been some common aspects in the spectrum allocations, including the fact that licences are granted for a limited period of time and tend to be subject to minimum coverage requirements.

7.2. First Come First Served

In the past governments often allocated spectrum licences to particular applications and then assigned parts of the spectrum to operators to use for specific purposes on a "first come, first served" basis. This mechanism is most appropriate where there is sufficient spectrum so that demand is unlikely to outstrip supply. Whilst such an approach has the merits of being fast, simple, practical and inexpensive it has become less suitable in areas such as mobile telephony where the demand has usually been greater than the available supply of spectrum. Consequently it has gradually been replaced by competitive methodologies, such as comparative selection and auctions, as a means of assigning spectrum in such cases.

7.3. Comparative Selection

Where demand exceeds supply, this method of selecting who will be licenced has been extensively used. In response to a call for proposals the licensing authority evaluates the merits of the applications received. Comparative selection (also known as "Beauty Contests"), which has been widely used across the world, requires the licensing authority to provide clear guidance notes describing the selection criteria for interested parties to follow in the preparation of their proposals.

The principal advantage of this approach is that the licensing authority can use a set of more extensive criteria to assess the proposals from a number of different perspectives

and to seek to maximise the overall benefits to consumers and the market. Selection criteria may include:

- services offered;
- network coverage;
- roll out;
- quality of services;
- capacity to optimise the use of frequencies; and
- coherence and credibility of the technical and business plans.

The licensing authority is therefore able to assess the proposals for mobile operations against a range of criteria with the financial aspects as just one of several factors to be taken into account.

Conversely as the applicant does not have to make a financial bid for the licence there is no incentive for them to use the spectrum in the most efficient way possible. However this can be addressed by ensuring that one of the selection criteria is efficiency in spectrum usage. Comparative selection also has the advantage in ensuring that the operators can invest in infrastructure and services as opposed to paying high spectrum fees.

7.4. Auctions

A third way of selecting licensees is to ask interested parties to submit financial bids for the frequency spectrum available. The applicants who submit the highest bids are then awarded a licence for that spectrum. Auctions have become an increasingly popular method for allocating spectrum in recent years (see Annex 2) with potential operators bidding substantial sums reflecting the fact that spectrum is a valuable scarce economic resource. These auctions have generated substantial government revenues across Europe.

The simultaneous, multiple round auction has become the most widely used approach in recent times and whilst there are variations from country to country the approach generally involves a simultaneous auction for different spectrum licences comprising a number of rounds of bids.

Market-based approaches to licence allocation have several advantages over administrative methods. In most situations market-based allocations compared with administrative processes tend to be:

- fairer as they are objective with an easily understandable outcome without any need for intervention from the licensing authority;
- more transparent as it is easy to understand how a licence was awarded, and
- more efficient as licences are awarded to the firms that value them most and ensures that that spectrum is allocated to its most efficient uses.

Despite these attractions there are also several arguments against spectrum auctions which should be considered including:

- Auctions invariably increase the operating costs of the 3G services and such costs may be borne by the consumers and may damage the roll out of mobile

services[16] although the counter argument is that the high bids act as an incentive for rapid roll out of infrastructure and services which is needed to recoup the initial investment cost and reduce the payback period.

- Those applicants seeking to provide more innovative and advanced services may not be successful in acquiring a licence.
- The process may favour larger bidders as they will possess greater financial resources to outbid smaller operators and could therefore inhibit new entrants from entering the market.
- Auctions encourage speculators who turn radio spectrum into a tradable commodity without creating any incremental benefit to the mobile market or consumers.

7.5. Conclusion

The Director General considers that the method of licensing spectrum should be decided depending on the demand expressed in using that spectrum.

Q7.1. Do you agree with the principle that the means of licensing spectrum should depend upon on the demand expressed in using that spectrum? If not, please explain your reasoning and offer an alternative view.

Each of the possible approaches to allocating spectrum have advantages and disadvantages, but on balance, assuming that demand will exceed the supply of spectrum, the Director General believes that comparative selection would be the most appropriate means of awarding spectrum and licences in the Bailiwick.

Q7.2 Do you agree with this view? If not please state your preferred approach with reasons.

[16] For example the French Finance Minister recently announced that France Telecom and Vivendi Universal (successful bidders for 3G licences) would have their licence terms increased from 15 to 20 years and also have their payments reduced from E2.5bn in year 1 to E619m with future payments related to revenue as the initial terms were too onerous. Whilst this amendment was welcomed by the European Commission, the German telecoms regulator, RegTP, declined to change the financial payments for its licensees in response to similar arguments.

8. Timetable

This document represents the first in a series of consultations leading up to the award of mobile licences which will be issued at the end of March 2003. The Director General aims to issue a report on this consultation early in 2002, having considered all responses. There will be a further consultation on the process early in 2002 which will address the terms and conditions of the licences as well as the application procedures for interested parties.

9. Conclusions and Questions

This paper sets out the Director General's initial views and proposals on:

- the availability of spectrum for mobile telephony in the Bailiwick of Guernsey;
- how the spectrum should be divided and the number of operators the market could support; and
- how licences for the spectrum should be allocated.

Comments on these proposals are welcomed and should arrive no later than 5.00pm on 1 February 2002 at the address given in Section 2.2. Respondents are reminded that the Director General will ensure that all responses to this consultation will be treated in confidence and submissions received by the OUR will not be made available for public inspection.

To aid respondents in addressing the issues raised in this paper each of the questions posed by the Director General is repeated again below.

Q4.1 Respondents are invited to submit comments on the appropriate spectrum packages that should be made available within the Guernsey telecommunications market. The Director General would particularly welcome expressions of interest in any particular package of spectrum along with the reasons why that package would be preferred.

Q6.1 The Director General seeks indications of interest from parties who would wish to enter the Guernsey 2G mobile telecommunications market to build and operate a second mobile transmission network. Respondents are invited to demonstrate their business case for market entry supported by quantitative data which will be kept confidential.

Q6.2 The Director General invites parties who are interested in the building and operating of 3G licenses in Guernsey to indicate their interest, providing information on the services potential licensees would seek to offer and the anticipated timescales associated with the roll-out and launch of such services.

Q6.3 Do you believe that new 3G entrants would need either direct access to 2G spectrum or access to the existing 2G network of Guernsey Telecoms? Please explain your reasons with reference to your expression of interest in the market, if any, indicating how your interest would be affected by the various options.

Q6.4 If you believe there is a need for measures to provide for access to existing 2G network facilities for new 3G entrants, do you believe there should be any time limit on such access and, if so, why?

Q6.5 The Director General seeks indications of the level of interest by potential market entrants of offering Indirect Access Services and the extent to which this could be viewed at an entry platform for a new network operator (in 2G or 3G) or as a substitute for operating a network. Respondents are invited to comment on the effect of introducing Indirect Access Services prior to the introduction of network competition.

Q6.6 The Director General invites comments on what shape MVNOs could take in Guernsey (including the outline service portfolio, level of investment by MVNO, and other relevant parameters to describe the opportunity and the operations of the MVNO) and the extent to which MVNO status could be viewed as an entry platform for a new network operator (in 2G or 3G) or as a substitute for operating a network.

Q6.7 The Director General seeks comments on access charging and on how this would influence the market entry strategy of potential players.

Q7.1. Do you agree with the principle that the means of licensing spectrum should depend upon on the demand expressed in using that spectrum? If not, please explain your reasoning and offer an alternative view.

Q7.2 Each of the possible approaches to allocating spectrum have advantages and disadvantages, but on balance, assuming that demand will exceed the supply of spectrum, the Director General believes that comparative selection would be the most appropriate means of awarding spectrum and licences in the Bailiwick. Do you agree with this view? If not please state your preferred approach with reasons.

Annex 1: Background to Radio Spectrum

This annex presents some background information to provide the context for the current consultation by briefly describing what is meant by "radio spectrum".

In order to understand the concept of radio spectrum as a finite resource, it is helpful to consider briefly just what is meant by "radio spectrum". The entire radio spectrum forms a relatively small part of the broader electromagnetic spectrum, which includes infrared, visible light and various other components, as illustrated in Figure 1. Note that this diagram has a logarithmic scale and that the total radio spectrum bandwidth amounts to just one thousandth of that of the infra-red range. Hence radio is not able to convey the sort of bandwidth that can be carried on today's optic fibre links, however for applications requiring mobility and wide area coverage such as broadcasting it is often the only viable solution.

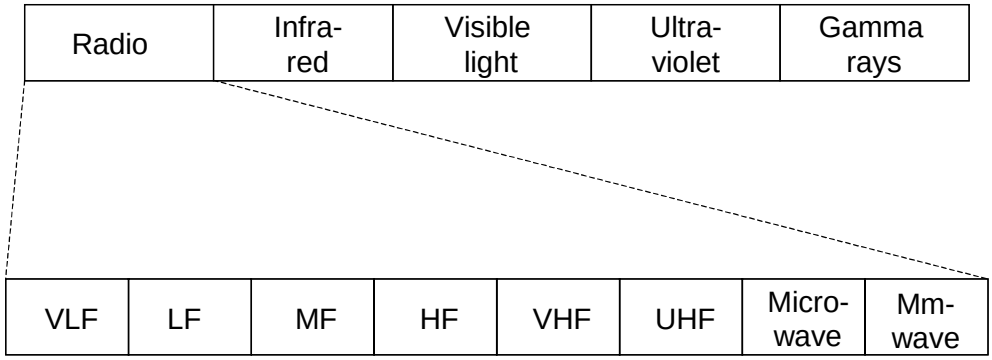

Figure 1: The Radio spectrum as part of the broader electromagnetic spectrum (not to scale)

Figure 2 overleaf shows the principal uses of the various parts of the radio spectrum, which are largely determined by the physical characteristics of the frequencies concerned. TV broadcasting and mobile communications are constrained within a relatively small part of the radio spectrum, which is further limited by the need to cater for other uses such as aeronautical, maritime, scientific and military applications. It is here that spectrum availability can present particular bottlenecks, for example by limiting the number of competitive service providers.

Because mobile and broadcast networks use higher frequency bands (above 3 GHz) to provide fixed radio links within their infrastructure, congestion can also arise in some of these bands. In the future, assuming broadband wireless fixed access is successful, similar bottlenecks may arise in the bands above 20 GHz that are earmarked for these services, even though at the moment (with the exception of a few specific geographic locations) there is a relative abundance of spectrum.

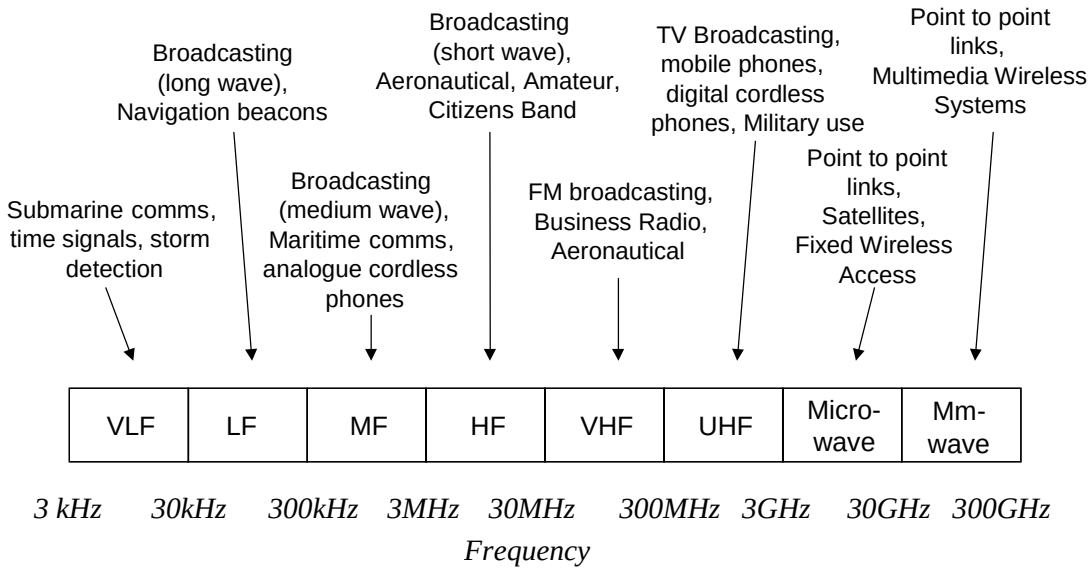

Figure 2: Uses of the radio spectrum (not to scale)

Annex 2: Summary of European 3G Licence Awards

Country	No of Licences	Licensing Process	Successful Applicants	Amount Raised
Austria	6 national licences 20 years	Auction with initial pre-qualification	Max.mobil, Connect Austria, Mannesmann, Mobilkom, Hutchison 3G Austria, 3G Mobile.	€832 million (€113 to €171 million each)
Belgium	3 National: 2x15MHz per operator plus 5MHz unpaired. Duration 20 years	Auction with €150m reserve price per licence.	Mobistar, KPN Mobile, Belgacom Mobile. fourth licence will be issued later to another interested operator.	€ 450 million in total.
Denmark	4 National: each 2x15MHz + 5MHz, plus possibility of additional 5MHz to highest bidder 20 years but no provision for renewal.	Auction ("Lowest winner" sealed bid auction)	HI3G, TDC, Telia and Orange	€600 million in total. €150 million for each licence.
Finland	4 national licences awarded 2 x 15 MHz paired frequency spectrum plus an additional 5 MHz unpaired spectrum per operator. 20 years.	Comparative selection	Radiolinja, Sonera, Telia Finland and Finnish 3G	No licence fee.
France	4 National	Comparative	First two licences	€619 million

	(15 years extended to 20 years).	selections plus fixed cost. Conditions have yet to be set for the award of two further licences.	awarded to Itineris (France Telecom) and SFR (Cegetel).	per licence and annual levy to be set. Later reduced.
Germany	6 National licences awarded, five 2x10 + 5 MHz, one 2x10 MHz. 20 years.	Auction	1st Stage : T-Mobil; MobilCom; VIAG Interkom; Group 3G; Mannesmann; E-Plus Hutchison. 2nd Stage: an additional 1x5Mhz unpaired to all except VIAG.	€50.8 billion.
Greece	3 National 20 years.	Sold at minimum reserve price (Auction)	Cosmote Mobile Telecoms, Panafon Hellenic Telecommunications and Stet Hellas Telecommunications	Between €146 and €176 million.
Ireland	4 National	Comparative selection.	Publication of tender document anticipated.	To be determined.
Italy	5 National licences awarded (15 year licences)	Auction with prequalification.	Preliminary winners are: H3G, Ipse, Omnitel, TIM and Wind.	€12.2 billion.
Luxembourg	4 National 15 years	Comparative selection		Anticipated end 2001.
Netherlands	5 National licences awarded (15 year licences)	Auction	Libertel, KPN Mobile, Dutchtone, Telfort and 3G Blue consortium.	€2.7 billion.
Norway	4 National licences awarded. 12 years.	Comparative selection. NB Broadband Mobile's license is to be re-awarded, via either auction or comparative selection (consortium went bankrupt).	Telenor, NetCom, Broadband Mobile and Tele2	€24 million per licence.
Portugal	4 National licences	Comparative selection with	Telecel, Optimus, Telecomunicacoes	€100 million per licence.

	awarded	fixed cost, based on technical ability.	Moveis Nacionais, OniWay.	
Spain	4 National licences awarded. 20 years.	Comparative selection.	Three incumbent GSM operators (Telefónica, Airtel, Retevisión) plus Xfera.	Government is considering a yearly licence fee of 150 mill euros, on top of the starting fee 130 Mill euros.
Sweden	4 National licences awarded at 2x15MHz each plus additional 5MHz unpaired per operator. 15 years.	2-stage comparative selection, based on business credentials plus coverage and roll-out commitments.	HI3G, Europolitan, Tele2 and Orange Sverige consortium.	Unclear.
UK	5 National licences awarded (20 year terms)	Auction.	Licences awarded to four incumbent GSM operators plus new entrant Hutchinson 3G.	€35 billion.

Sources: UMTS Forum, Cullen International.