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CONSIDERATIONS IN FORMULATING A SPECTRUM STRATEGY

SPECTRUM MANAGEMENT STRATEGY STATEMENT 2005 - 2007

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Considerations in Formulating a Spectrum Strategy

4.1. Introduction

ComReg has a legal requirement to ensure the efficient management and use of the radio spectrum. To achieve this objective, ComReg has developed a strategy with regard to radio spectrum which includes a number of strategic goals, namely:

- Facilitating access to radio spectrum, particularly for innovative technologies and services;
- Maximising the economic and social benefits arising from the use of radio spectrum;
- Promoting the efficient use of scarce radio spectrum resources; and
- Ensuring compliance with international requirements and the avoidance of harmful interference.

This strategy is updated periodically to reflect changes in markets, technology and demand for radio spectrum for different applications. A key purpose of the strategy is to consider future demand for spectrum and whether any changes to the way spectrum is managed and allocated to different services are required to meet demand growth. The scenarios are presented in Annex 4.

The strategy is developed in the context of the global, regional (European) and national regulatory framework that governs spectrum use in Ireland. The strategy comprises a number of strategic goals in relation to each of the above areas along with a number of issues in relation to specific radio services that require consideration in order to meet the broad strategic objectives. The strategy is presented in Chapter 5 of this document. The remainder of this Chapter addresses the key issues that have been considered by ComReg in developing this strategy.

4.2. Key Drivers affecting future spectrum demand

A key element of ComReg's spectrum strategy is to ensure as far as possible that sufficient spectrum is available to meet future demand. Spectrum demand is a function of the demand for the services and applications that require spectrum, but is also influenced by technological developments that enable spectrum to be used in a more efficient manner. For example, the migration from analogue to digital TV broadcasting enables several TV programme services to be simultaneously transmitted using the same amount of spectrum as a single analogue programme service.

Demand for spectrum is also somewhat dependent on substitutional effects driven by technical and/or economic limitations of other non-wireless technologies, for example the use of fixed wireless access technologies to improve the availability and reach of broadband services. Wider social and economic developments affecting people's approach to work and leisure will also impact on demand, particularly the extent to which people wish to communicate on the move and the desire for multi-room utilisation in both the home and in the workplace.

Drivers of spectrum demand can be grouped into five main categories, namely:

- Markets;
- Technology;
- Social & cultural;
- Economic;
- Legal & regulatory.

The main drivers and constraints arising from each of these are discussed in the following sections.

4.2.1. Market Drivers

The key market drivers that are likely to impact on future radio spectrum demand in Ireland are:

- (i) **Convergence**, i.e. the deployment of multiple digital media such as broadcasting, telecommunications and information technology to deliver integrated multimedia content and services;
- (ii) **Demand for broadband fixed services**, particularly in areas where non-radio alternatives are not technically or economically viable;
- (iii) **Demand for multi-channel TV and radio**, particularly if mobile or portable reception is required, necessitating a terrestrial transmission platform;
- (iv) **Demand for mobile multimedia content**, particularly delivery of high volumes of audiovisual or other high bandwidth content which could create demand for further mobile spectrum or access to alternative delivery platforms such as broadcasting technologies.

4.2.2. Technology Drivers and Enablers

New technology developments are taking place that could have a significant bearing on how spectrum is used in the future to deliver electronic communication technologies. Some of the key developments include:

- Convergent networks and devices that combine fixed, mobile and broadcast transmission media enabling different content and services to be delivered to the same terminal using the most appropriate choice of platform (see above);
- Improved spectrum efficiency, enabling higher volumes of data to be transmitted in a given amount of spectrum (e.g. technologies such as Ultra Wide Band (UWB) offer the potential to carry very large amounts of data over short distances);
- Cognitive and software defined radios that can adapt dynamically to different environments depending on time and location, frequency availability etc.;
- The increasing practicality of utilising bands located higher in the frequency spectrum.

4.2.3. Social / Cultural Drivers

Radio spectrum has a crucial role to play in supporting key social objectives, such as ensuring widespread access to broadband services and public service broadcasting content or the efficient delivery of public services such as health and law enforcement. Broadcasting has played a key role in promoting national culture and language while new opportunities for regional and specialist programming will arise with the introduction of digital services.

There are a number of areas where social, cultural and public policy issues might influence demand for radio spectrum. Two areas where these factors are particularly relevant are extending the availability of broadband access and future broadcasting services. To some extent these are linked since digitisation of television may provide opportunities to extend future broadband availability either by using the digital TV platform itself or by making use of some of the UHF spectrum to extend broadband access in rural areas.

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Considerations in Formulating a Spectrum Strategy Continued

Three other drivers that must be considered are:

- The need to ensure access to spectrum for government services;
- The use of radio spectrum to improve traffic management and public transport;
- Environmental issues related to infrastructure sharing.

4.2.4. Economic Drivers

Many of the services that use the radio spectrum are dependent on discretionary spending by consumers and demand is therefore likely to be influenced by levels of disposable income and the general state of the economy. Ireland's rapid economic growth over the last decade has undoubtedly contributed to the boom in mobile communications and continuing growth is likely to drive demand for new services and content. Lifestyle and employment changes will also have a bearing, for example increased working from home (i.e. teleworking) could spur demand for more Broadband connections.

According to the most recent Central Bank Quarterly Bulletin, Irish GDP is projected to grow by 5.5 per cent in 2005 and to continue at a broadly similar pace in 2006. Overall consumer price inflation is expected to average about 2.5 per cent in 2005 and is projected to rise to 2.75 per cent in 2006⁵. According to the Central Bank report, there are signs that consumer expenditure has strengthened this year, albeit at a gradual rate and a positive outlook for labour market performance may support the growth in disposable incomes and help to underpin positive consumer sentiment. This somewhat faster pace of consumer spending growth is expected to strengthen further next year, according to the analysis. The environment for growth in the wireless sector therefore is likely to remain strong taking into consideration business confidence and lifestyle changes that place a premium on convenience and mobility. This could be compounded by increasing levels of traffic congestion, leading to increased use of tele working and driving demand for mobile and broadband services.

4.2.5. Legal and Regulatory Drivers

Ireland's legislative framework for wireless services is largely driven by European developments, such as the introduction in 2003 of the new regulatory package. The main emphasis of this framework is the promotion of competition and a single European market in electronic communications, however there is increasing interest at the European level in liberalising spectrum management to support innovation and the development of new wireless products and services.

Spectrum liberalisation provides the potential to use spectrum for more than one purpose and is likely to be a key enabler of technology convergence. For example, in the future spectrum currently used for broadcasting might also be used to support mobile services (such as multimedia content delivery), or spectrum currently used to deliver fixed access services could also provide mobility. These possibilities raise many issues for incumbent users of radio spectrum and spectrum management agencies alike⁶.

⁵ Source: Central Bank Quarterly Bulletin 3 (July) 2005

⁶ i.e. current users of spectrum operate with knowledge of alternative uses for occupied spectrum and potential use of adjacent band spectrum.

In the next 2-5 years it is expected that a number of new Bills relating to the regulation of the electronic communications sector will be enacted. These include a new Telecommunications (Miscellaneous Provisions) Act, a new Radiocommunications Act, which will replace the Wireless Telegraphy Acts 1926-1988, and a new Broadcasting Act. The implications of this new legislation will be covered in future strategy documents.

4.3. ComReg Wireless Vision for 2010

4.3.1. Introduction

Based on the responses to the scenario analysis presented in consultation document 05/01, ComReg has assessed the potential spectrum demand trends for various services over the next five years. This is intended to represent a plausible vision of a future where a substantial increase in spectrum demand would arise. A key element of ComReg's spectrum strategy will be to provide, as far as practicable, the flexibility to accommodate such demand should it arise. The scenario analysis on which the assessment is based is presented in Annex 4.

4.3.2. ComReg Vision for Specific Wireless Services

- **Mobile:** Widespread demand for high speed mobile data means existing 2G and 3G spectrum is fully utilised and pressure is growing for access to other bands such as the 2.6 GHz band which is still being used by MMDS services.
- **Wireless Broadband Services:** Demand for "wireless DSL" type services means that the 3.5 GHz band in particular is heavily used and has reached saturation in some urban areas. 10 GHz is used in these areas to provide additional capacity and 5.8 GHz is widely used in smaller towns and villages. 26 GHz is increasingly used to serve business users and trial services are underway at 40 GHz offering STM-1 or higher data rates. The fixed link bands are heavily used to provide backhaul in support of wireless broadband services.
- **Broadcasting:** Digital TV is now in the majority of homes, many of which have multiple television sets and rely on a mix of platforms for reception. Regional trials of mobile TV have been successful and there is now pressure from broadcasters and mobile operators to expedite analogue switch off to free up spectrum for national mobile TV multiplexes. DAB in Band III is offering a range of new, specialist radio channels and L-band is being used to deliver mobile multimedia content to the latest generation of multi-mode phones. Portable and mobile content TV and other audio / visual material receivable on hand-held devices is a big growth market and there is pressure for access to UHF TV channels to deliver services to hand-held DVB-enabled mobile phones.
- **Satellite:** Satellite is being used to deliver broadband backhaul to rural areas, which are then served by licensed wireless networks or licence exempt wireless networks, typically in the 5.8 GHz band.
- **Fixed links:** There is strong growth in all bands above 15 GHz to provide access infrastructure links for mobile and FWA networks. Bands below 15 GHz are congested as they are heavily used for the provision of national broadband networks in support of communications networks.
- **Licence Exempt Spectrum:** In addition to demand for licence exempt wireless broadband services, there is also increasing demand for spectrum to accommodate short range applications for broadband connectivity, RFID applications and automotive applications such as collision avoidance radars.

4 Considerations in Formulating a Spectrum Strategy Continued

4.3.3. Summary of Anticipated Spectrum Demand trends

The following table summarises the anticipated trends in demand for radio spectrum by various sectors, based on the vision described above.

- Key:
- ↑↑ = high demand growth anticipated
 - ↑ = moderate demand growth anticipated
 - ↔ = little change anticipated
 - ↓ = moderate decline anticipated
 - = demand not anticipated

	Below 3 GHz	3 – 15 GHz	Above 15 GHz
Mobile	↑	↔	-
Wireless Broadband	↑	↑↑	↑
Broadcasting (terrestrial)	↔	-	-
Satellite	↔	↔	↔
Fixed Links	↓	↔	↑
Licence Exempt	↑	↑	↑

4.4. Spectrum as a Contributor to Ireland’s National Competitiveness

Ireland possesses some unique advantages compared to its European neighbours when spectrum is considered as a national resource. On the one hand, we have a well-developed high-tech sector with many leading global IT and telecoms companies having facilities here. On the other, Ireland’s position on the western edge of Europe and its relatively low population density, mean that the radio frequency spectrum is relatively uncongested. For the most part, frequencies can be made available as and where required. These natural advantages mean that Ireland is ideally located as a manufacturing base and/or test-bed for companies wishing to test, develop and manufacture new products and services for global markets.

However, if this potential is to be realised, certain challenges must be overcome. While the traditional methods of frequency allocation and assignment within the accepted national and international framework are generally perceived as fair and equitable (both between operators or end-users, and between different countries), they have their disadvantages. They can be slow and inflexible: new assignments at international level can take anything from 3 to 10 years to achieve, while national licensing for a new, innovative service can take from 1 to 3 years. In addition, in assigning spectrum for new services there are uncertainties involved in assessing the level of demand. This can result in inefficiency, in the economic sense: spectrum does not end up with those users who place the highest value on it. It can also stifle innovation, by favouring incumbents over new entrants, since any delay in licensing new services tends to favour the status quo⁷.

⁷ See, for example, M. Cave, "Review of Radio Spectrum Management", March 2002, available at www.ofcom.org.uk

A recent study for the European Commission⁸ found that current methods of spectrum management could not be relied upon to distribute spectrum efficiently. They generated less economic value than they could, and so deprived EU citizens of economic benefits. The study recommended the harmonised introduction, throughout Europe, of both secondary trading (the transfer of spectrum usage rights between parties in a secondary market) and liberalisation (the relaxation of restrictions on services or technologies associated with spectrum usage rights as well as the possibility of reconfiguring usage rights).

A report⁹ by Forfás to the Minister for Enterprise, Trade and Employment identified wireless communications as a potential area of high growth, and recommended actions to promote the development of wireless as a sustainable internationally traded sector from Ireland. These actions included a set of recommendations on accelerated liberalisation of spectrum management. Both in response to this, and as part of its overall responsibility to ensure efficient spectrum management and promote innovation, ComReg has taken a number of initiatives in this area:

- After public consultation, ComReg has decided to extend and liberalise its test licensing regime to include commercial trial licences and to extend the possible duration of both test and trial licences. The expanded test licensing regime will be suitable for use for tests and trials of innovative technologies and services including Ultra Wide Band (UWB) trials.
- This paper contains proposals for how the issues of spectrum liberalisation and trading in spectrum rights of use might be addressed.
- Through its Forward Looking Panel¹⁰, ComReg has established links with third-level colleges and universities, which it intends to use to spread awareness of the availability of spectrum for test purposes.

ComReg will continue to promote the use of spectrum for R&D purposes, not just as an end in itself but as an input into the growing applications in the software sector. The Forfás report recommended that Ireland should focus its future development on its existing established strengths in operations support systems (OSS), security and the billing and transaction management area of the wireless sector. It also recommended that Ireland had the potential to expand its core strengths into certification and hosting activities, exploiting current activities in middleware to create a European hub for the emerging mobile application hosting industry. The realisation of this concept will require a concerted approach from various agencies and departments, including ComReg, Forfás, IDA, Science Foundation Ireland and the third-level education sector. Availability of spectrum is only one input; other factors, such as Ireland's competitive corporate tax regime, will also play their part. ComReg looks forward to co-operating closely with other agencies, and would welcome further suggestions on how spectrum use can be facilitated and encouraged as a driver of international competitiveness for Ireland.

⁸ "Study of conditions and options in introducing secondary trading of radio spectrum in the European Community", Analysis, DotEcon and Hogan & Hartson; available at: http://europa.eu.int/information_society/policy/radio_spectrum/docs/ref_info/secondtrad_study/secondtrad_final.pdf

⁹ Wireless Communications: An Area of Opportunity for Ireland, April 2004, available at: http://www.forfas.ie/publications/forfas040401/forfas_wireless_report_040401.pdf

¹⁰ The ComReg Forward Looking Panel consists of senior-level external industry advisors who meet to help guide and assist the forward-looking programme. The panel meets in a workshop setting two to three times a year to review and help develop work carried out under the programme, to propose new topics to be addressed, and to draw attention to potential new issues.

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Considerations in Formulating a Spectrum Strategy Continued

4.5. Innovation

Creating a regulatory environment supportive of innovation in new electronic communications services is critical in positioning Ireland to realise the benefits of a vibrant telecommunications industry. This philosophy underpins much of ComReg's approach to spectrum management. Two recent examples where this has been put into practice include:

- the introduction of licence exempt wireless broadband access in the 5.8 GHz band (5725 – 5875 MHz);
- the test and trial Licence scheme¹¹, introduced after public consultation in May 2005, is a new licensing regime for radio service and technology trials which will bring Ireland to the forefront as an ideal location for research and development. One of the key features of the scheme is that it allows innovative new wireless services to be offered to the public on a trial basis. This will allow new service concepts to be tested in a realistic environment at an early stage of development, ensuring that subsequent commercial offerings are properly tailored to meet the needs of users.

4.6. Placing a Value on Radio Spectrum

The value of radio spectrum derives from its utility and its scarcity. Because of interference between radio emissions use by one user can deny use by another. In addition some frequencies are more valuable than others because of their propagation characteristics and because particular bands are reserved for particular uses. For example, frequencies in the 300 MHz to 3 GHz range are currently generally regarded as the most valuable because they support wide area mobile applications which are highly valued by users because of the functionality they offer and because there are few, if any, realistic alternatives.

As a key input to revenue-generating operations like telecommunications and broadcasting, radio spectrum has a tangible economic value to many of those who use it. This value becomes most apparent when radio spectrum is auctioned, as is the case in many countries around the world. In respect of commercial uses of the spectrum this value derives from two factors. First, there are the additional economies of scale and profits that an operator can earn by supporting more users or offering a better quality service as a result of having more spectrum. Secondly, infrastructure and other costs may be reduced if additional spectrum is made available to a user. For non-commercial users valuation of the spectrum is more problematic because the value of the outputs they produce is less tangible. For example, use of mobile radio enables the emergency services to respond more quickly to emergency calls, the value of which may be manifested in terms of lives saved, criminals apprehended and fires extinguished.

ComReg has a legal obligation to ensure the optimal use of radio spectrum and levies fees on spectrum use in order to support this objective. Optimal use of spectrum depends on a number of factors, including:

- demand for spectrum in particular bands and/or geographic areas;
- public policy considerations;
- economic and market considerations;
- social considerations;
- technology; and
- legal factors (e.g. European or international obligations).

¹¹ See ComReg Document 04/115: Opportunities for Trialling Wireless Services and Technologies in Ireland.

In general, spectrum fees should be set at a level that promotes technical efficiency, encourages the rollout of infrastructure in rural areas and supports the development of innovative services. ComReg is considering whether its current fee structure adequately supports these objectives and will be consulting on spectrum fees in 2005.

4.7. Liberalisation of Spectrum Management

In common with other European regulators, ComReg is reviewing its approach to some aspects of spectrum management to ensure that they are compatible with the evolving electronic communications markets and technologies. In particular, ComReg recognises that convergence between the fixed, mobile and broadcast sectors may favour a more flexible approach to spectrum allocation and licensing. "Liberalisation" of spectrum management by removing regulatory constraints that are not required to avoid harmful interference or to meet specific policy objectives could provide such flexibility.

Examples of liberalisation may include relaxing the rules relating to the transfer of licences between undertakings or the types of service that can be provided in particular parts of the spectrum. In the short term, ComReg is considering the introduction of a new National Business Radio licensing scheme for the provision of services to third parties which, in comparison with existing business radio licences, will allow licence holders substantially greater flexibility in how they use the spectrum. In the longer term, there may also be opportunities to provide greater flexibility in the services that can be delivered in fixed, mobile and broadcast bands, particularly where the technologies deployed in these bands are capable of addressing different market sectors.

ComReg continues to study the issue of spectrum liberalisation and plans to consult on this issue in 2005/2006.

4.8. Use of Market Mechanisms for Spectrum Management

4.8.1. Introduction

In recent years there has been increasing international interest in the application of market based approaches to spectrum management, with the objective of increasing flexibility and promoting more economically efficient use of the radio spectrum. The two principal market based mechanisms that have been applied are auctions and secondary trading. Auctions have been used as an alternative to comparative selection procedures for awarding rights to use radio spectrum where the number of rights available is limited. Secondary trading allows spectrum rights to be traded between entities, providing a means of accessing radio spectrum via the market rather than the regulator (although the regulator still has a role to ensure that the traded spectrum continues to be used in an appropriate manner).

4.8.2. ComReg Position on Market Mechanisms

In the consultation document ComReg compared a number of different market mechanisms and the advantages and disadvantages of each mechanism. The comparison included comparative selection procedures (otherwise known as 'beauty contests') and auctions.

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Considerations in Formulating a Spectrum Strategy Continued

ComReg does not at this stage favour any one specific approach for awarding spectrum rights, but prefers to consider each case on its own merits. ComReg will use auctions as an alternative to comparative selection procedures for future spectrum assignments where this is appropriate. For example, an auction has been proposed for the award of wideband digital mobile radio services in the 400 MHz and 900 MHz bands.

4.8.3. ComReg Position on Spectrum Trading

Spectrum trading allows a licensee to transfer the right to use all or part of the licensed spectrum, usually in return for some financial consideration. Trading can take several forms that includes transfer of licences, reconfiguration, partial trading of spectrum, spectrum leasing and change of spectrum use. These variants, their operation, advantages and disadvantages, as discussed in the consultation document, can be applied either individually or in combination, e.g. partial trading of spectrum may or may not involve reconfiguration or change of use, depending on the prevailing rules and the wishes of the trading parties.

ComReg will be studying these concepts in relation to trading and change of use as part of its broader work on spectrum liberalisation. Although some aspects of this require revision of the primary legislation (Wireless Telegraphy Acts), ComReg will be seeking opportunities to liberalise specific frequency bands or services where this would provide benefits and could be done within the scope of existing legislation. ComReg expects to consult on specific proposals later in 2005.