

MULTIMEDIA COMMUNICATIONS ON THE MOVE

**A CONSULTATION DOCUMENT FROM THE
DEPARTMENT OF TRADE AND INDUSTRY**

The logo for the Department of Trade and Industry (dti) consists of the lowercase letters 'dti' in a bold, serif font. The 'd' and 't' are connected, and the 'i' has a dot.

Department of Trade and Industry

FOREWORD BY THE MINISTER FOR SMALL FIRMS TRADE AND INDUSTRY

On behalf of the Government, I am delighted to be able to set out in this consultation document the Government's proposals for implementing Third Generation mobile communications systems in the United Kingdom.

European operators and manufacturers have succeeded in setting the world standard in mobile telecommunications technology. In the UK, we have been at the forefront of establishing First Generation analogue systems, which are now being phased out, and we took the lead in rolling out Second Generation digital systems based on GSM. This has become the world standard allowing roaming to well over a hundred countries world-wide. The UK was also the first country to licence PCN DCS 1800 operators, now being followed by many other countries particularly in Europe. European consumers throughout society have access to advanced mobile services whose prices have been driven down by competition to a level where they are affordable to almost everyone. In terms of quality, choice and value for money, the European telecommunications industry is a success story we can be proud of.

Increasing competition is stimulating consumer interest in the sector, and this means that the demands customers make are becoming more sophisticated. There is pressure for mobile networks to provide the sort of advanced, high speed, high quality interactive services which fixed networks are now capable of offering - indeed customers are expecting to be able to have their telecommunications needs serviced wherever they are, and even on the move. This is the challenge which incoming Third Generation mobile operators must address. And the market we are talking about is no longer local - we are moving rapidly towards a global market.

Some industry projections indicate that around 30% of the UK population - perhaps approaching 20 million people - will be regular users of a mobile phone by the early years of the next century. To provide clarity and certainty in a market vital to the UK economy, a number of key decisions on Second Generation were taken last year which will ensure the successful continued growth of the market for several years to come. However, we cannot leave it at that: mobile communications is a fast moving, highly capital intensive market and we must now look to the future. That future offers the prospect of new innovative and exciting multimedia services being delivered not just to those at the end of fixed access but also to those on the move. The Government is determined that the UK should play a leading role in this future both within Europe and internationally. We must capitalise on the European lead: this document sets out to describe how the next generation of mobile networks might look. We want this to be market driven and competitive. We want manufacturers and operators to turn their attention now to how they want to use scarce Third Generation mobile spectrum to meet the needs of consumers.

This consultation document sets out the Government's plans which are expected to lead to the award of several Third Generation licences. Competing operators should have licensing certainty before the end of the next financial year (1998-99), leaving those who are successful

well placed to take a world lead in the development of Third Generation standards, to offer full multimedia services to mobile customers and to participate in the many licensing opportunities arising overseas over the next few years.

We can all look forward to exciting prospects in terms of new jobs, new technology, new services and substantial investment through the early implementation of Third Generation systems in this country.

I would welcome your comments.

Barbara Roche MP

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MULTIMEDIA COMMUNICATIONS ON THE MOVE

A DTI CONSULTATION DOCUMENT

1. INTRODUCTION

1.1 The Government is committed to ensuring that the UK maintains its lead in the provision of competitive mobile communications to the widest possible cross-section of our society. This consultation document seeks views and comments on the Government's main proposals for licensing operators to provide Third Generation mobile communications systems early in the next century. The Government wants to see strong competition in this new market to deliver choice to customers, to spur innovation and keep pressure on prices.

1.2 From the start of cellular mobile telephony in the UK in the mid 1980s until the early 1990s, two operators, Vodafone and Cellnet, were licensed to provide cellular mobile telephony in the UK. Numbers of subscribers grew steadily over this period to a total of around 2 million. Following the launch of digital GSM services by Vodafone and Cellnet in the early 1990s, and the launch of services by the two Personal Communications Network operators, One 2 One and Orange, in 1993 and 1994 respectively, the numbers of subscribers has grown even more rapidly and exceeded 7 million earlier this year. This represents over 12 % penetration of the total population of the United Kingdom. In Scandinavia penetration is already over 30% and other major countries in Europe, including the UK, are expected to follow this trend. Industry forecasts¹ project well over 100 million mobile terminals in Western Europe by early next century, with the UK expected to contribute approaching 20 million to this total.

1.3 This exciting growth prospect ensures the success of Second Generation mobile communications utilising the GSM and DCS 1800 digital standards. As costs of both phones and services decrease, mobile phones are destined to be a commodity item, where mobile use will become the norm, and the growth in new mobile connections is expected to outstrip the growth in fixed connections. In the early years of the next century it should become commonplace to make contacts with individuals by ringing their mobile rather than their fixed number or a single personal number encompassing both. There will also be increasing convergence between the fixed and mobile telecommunications markets.

1.4 It was against this high growth scenario that some key decisions in the field of mobile spectrum allocation were taken last year. These were that Vodafone and Cellnet were to be allocated spectrum in the DCS 1800 band to provide innovative new services, for example to corporate customers, with the facility to use dual mode handsets either as mobile phones outside the office or for wireless applications inside the office. It was also decided that Vodafone and Cellnet should plan for the closure of their analogue networks by 2005. Both operators are now in the process of migrating services from their analogue networks to GSM. In the same series of decisions, additional spectrum in the DCS 1800 band was reserved for One 2 One and Orange, to be allocated to them based on demonstrable need. Following

¹ UMTS Forum Report "A Regulatory Framework for UMTS"

submissions from both PCN operators earlier this year, the Government has recently announced the allocation of a further 2 x 5 MHz to each PCN operator for the provision of similar innovative new services based on the DCS 1800 specification. This series of decisions means that all available Second Generation cellular/PCN spectrum has now been allocated.

1.5 Looking to the future, considerable work has been going in a number of international and industry fora over recent years on the development of Third Generation mobile communications standards and the identification of appropriate spectrum. The DTI (the Radiocommunications Agency and the Communications and Information Industries Division) and OFTEL have been participating in these various fora for some time. An industry advisory document "Developing Third Generation Mobile and Personal Communications into the 21st Century" was published by the DTI in the spring. The 18 comments received by the closing date of 31st May have been carefully considered before preparing this document (see Chapter 3). The main aspects of all the international and national work on Third Generation relevant to the licensing by the Government of Third Generation operators are set out in this document.

1.6 We are moving rapidly towards a new era of communications and information technology. Third Generation mobile systems will take personal communications for the mobile user into the Information Society of the 21st century. These systems will deliver multimedia services (either voice, video or data) to people on a global basis and provide them with access to new innovative services which are now only starting to be conceivable over the fixed network. The clear goal of Third Generation systems is to offer mobile personalised multimedia communications to the mass market regardless of location, network or terminal.

1.7 The remainder of this consultation document sets out in greater detail:

- the services that Third Generation systems should support,
- a summary of the work that has gone on in various international fora in developing Third Generation standards and identifying appropriate spectrum on an international basis,
- a review of the spectrum available for Third Generation in the UK,
- consideration of the standards for Third Generation that UK licensees will be required to support,
- a guide to operators seeking to obtain Third Generation spectrum and licences in the UK,
- a summary of the main UK regulatory issues associated with Third Generation, and finally,
- an indication of where Third Generation might go in the longer term.

1.8 Written comments should be sent by **17 October 1997** jointly to:

Christopher Holmes	Dr Don Jayasuriya
Communications and Information Industries Division	Advanced Public Networks Unit
Department of Trade and Industry	Radiocommunications Agency
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Written comments will be made publicly available except where respondents indicate that their response or parts of it are confidential. Respondents are requested to separate any confidential material into a clearly marked confidential annex. Unconditional permission will be assumed unless the author expressly states otherwise. Any copyright attached to responses will be assumed to have been relinquished unless it is expressly reserved.

This consultation document is also being published on the Internet. The address for the Web pages is:

<http://www.open.gov.uk/radiocom/rahome.htm>

It would be helpful if five copies of all comments could be sent to each address and it would assist if lengthy publicly available comments are also supplied on disk, preferably in 'Word 6' for placement on the RA's Internet Web Page.

Additional copies of the document can be obtained by contacting 0171-215 1785.

2 WHAT IS UMTS AND WHAT CAN IT OFFER?

Introduction

2.1 UMTS - the Universal Mobile Telecommunications Service - represents the Third Generation of mobile telecommunications. The First Generation, based on analogue technology, provided simple voice telephony. The current Second Generation networks, based on the European digital GSM standard, provide additional data facilities, ranging from Short Messaging Services (SMS) to narrow band ISDN under the latest Phase 2 standards. This is sufficient for basic data services like fax or electronic mail, but cannot cater for high resolution video or multimedia applications. UMTS will bring mobile networks significantly closer to the capabilities of fixed networks, providing mobile users with full interactive multimedia capabilities at data rates up to 2 Mbits/s, in addition to conventional voice, fax and data services. Improvements in coding and data compression technology will provide better speech quality and more reliable data transmission.

2.2 As well as enhancing the range and quality of mobile services in the market, UMTS will, for the first time, provide truly ubiquitous coverage by providing combined access to cordless, cellular and satellite networks from a single hand-held terminal. Reflecting the

growing convergence between fixed and mobile telecommunications and the increasing deployment of intelligent network technology, UMTS services are also likely to be accessible over fixed networks. Each subscriber will have a unique personal identifier which will enable the home network to be accessed via any convenient fixed or mobile terminal, a concept known as the Virtual Home Environment (VHE). Personal mobility will thus be catered for even where the user is not carrying a mobile terminal, or is out of range of a mobile network. UMTS may also provide mobile access to a range of video based communication, information and entertainment services, increasing the synergy between the broadcasting and telecommunication markets.

2.3 UMTS is intended to form part of the International Mobile Telecommunications 2000 (IMT-2000) family of global Third Generation mobile standards, which will for the first time enable roaming on a truly world-wide basis.

The UMTS Market and Implications for Competition

2.4 UMTS will combine the mobility functions of today's mobile networks with the enhanced facilities of fixed networks and will effectively straddle the upper ends of both the traditional fixed and mobile markets. This has significant implications for competition in the provision of telecommunications services, as barriers to entry may serve to enhance the market power of existing players in these markets. With rapid evolution currently underway in both fixed and mobile telecommunications, it is unclear precisely how the market will develop, however, at least two trends appear to be developing. One is that consumers are increasingly interested in obtaining bundled telecommunication services combining fixed and mobile offerings, the other is a continuing trend towards more sophisticated forms of communication such as electronic mail and the Internet. It follows that an established operator in either the fixed or mobile market could enhance its existing market power by the addition of UMTS to its portfolio. Where an operator already has a strong position in both the fixed and mobile markets, a disproportionate degree of market power may result and further measures to counter anti-competitive behaviour may be needed. To date, government policy has been to place specific restrictions on such operators: however, increasing competition means alternative regulatory measures to open up the market to other players may now be more appropriate (eligibility to apply for a Third Generation licence is covered in Chapter 6).

2.5 It is expected that multiband/multimode terminals will enable users to be provided with UMTS services in conjunction with existing Second Generation services such as GSM and PCN. For instance UMTS could initially provide wideband services in limited areas, with elsewhere GSM/PCN providing a more basic wide area service. It may be some years before UMTS will achieve the coverage of second generation networks, although satellite coverage will be available (see Chapter 6). Existing network operators awarded UMTS licences may therefore enjoy a significant competitive advantage over entirely new operators in respect of their infrastructure, both in terms of having national GSM / PCN coverage and access to UMTS base station sites. The effect would be to increase the existing operator's market power, diminishing competition. This would represent a significant barrier to entry for new operators. Given the convergent nature of UMTS, a similar situation would arise if a well established fixed operator were awarded a licence. The Government is considering how

such a barrier to entry might best be overcome and **would welcome views on how a more open UMTS market might be achieved** (see also Chapter 6).

2.6 In the longer term the establishment of a secondary market in radio spectrum may be needed to address the other major barrier to entry, spectrum scarcity. Continuing convergence of the fixed and mobile markets should then provide greater opportunities for competition from new operators and service providers, provided that these barriers to entry can be addressed.

Who will provide UMTS Services?

2.7 The provision of UMTS services is likely to be based on a three level hierarchy, comprising service providers, network operators and content providers. UMTS may well be offered as part of an integrated service package, combining fixed and mobile elements tailored to the individual or corporate customer's needs. New opportunities will therefore exist for service providers to develop innovative packages combining access to UMTS and other networks. The networks themselves will be run by competing operators who are likely to be selected by a competitive auction process (subject to the successful passage of the Wireless Telegraphy Bill 1997). UMTS will also provide an opportunity for the introduction of new operators to compete with existing GSM and PCN operators, although, as noted above, regulatory measures may be required to offset the incumbent advantages enjoyed by existing network operators.

2.8 On-line content will be a major factor in the take up of interactive multimedia services and there will be significant opportunities for the development of services specifically aimed at mobile users, for example combining location and routing data with existing on-line data resources. First and Second Generation services were largely pioneered by established players in telecommunications but the IT industry will also have a major role to play in ensuring the success of UMTS.

2.9 The satellite elements are likely to be run by international consortia and provided in individual countries through local service providers, probably as part of an integrated package.

Who is behind UMTS?

2.10 UMTS is a European concept in which the UK has been playing a leading role. It is being promoted internationally by ETSI (European Telecommunications Standards Institute), CEPT (the Conference of European Post and Telecommunications Administrations), UMTS Forum and the European Commission. It has the support of the major European fixed and mobile network operators and the manufacturing community. It will initially use radio spectrum around 2 GHz allocated globally for Third Generation mobile use and will be the European implementation of a global family of mobile systems known collectively as IMT 2000 - "International Mobile Telecommunications 2000" (see also Chapter 5).

Why is UMTS important to the UK?

2.11 Current GSM mobile networks cater for voice and low speed data but are not well suited for wideband applications like video, high speed internet access or multimedia. There is growing market interest in value added wideband services, principally on fixed networks but with an increasing interest in mobility as well. UMTS will provide network operators, service providers and content providers with the means to offer a much wider portfolio of service than is currently available and provides the UK with an opportunity to repeat the success achieved with First and Second Generation systems.

When will UMTS happen?

2.12 The first UMTS services are expected to enter service around 2002, with widespread global availability anticipated around 2005 - 2007. It is the Government's intention to provide licensing certainty for the provision of UMTS services during the next financial year (1998-99), enabling operators to roll out networks in line with this schedule (see Chapter 6.)

What services will UMTS offer?

2.13 Ultimately, the range of services offered over UMTS networks will be determined by the needs of the market over time. However, it is possible to anticipate a number of key new offerings which will be facilitated as a result of greater bandwidth and enhanced network intelligence. Multimedia services, i.e. the provision of combined voice, audio-visual and high speed data services, will feature prominently and are likely to include facilities such as:

- high speed internet and intranet access and electronic mail,
- video telephony and conferencing,
- on-line banking and shopping,
- entertainment services, e.g. audio on demand, video games,
- direct instant access to home or office IT systems, regardless of location.

All of these will be in addition to conventional voice and data services, using bandwidth "on demand" as and when required. However, the extent to which UMTS licensees will be able to introduce new services will depend, in part, on the competition from existing GSM and PCN operators. As noted above, a framework will be required to prevent potential anti-competitive behaviour by those with existing market power should they succeed in gaining a UMTS licence.

2.14 Compact, lightweight terminals, using advanced graphics and voice recognition technology, will enable complex data files to be sent or received literally anywhere in the world. However mobility is not limited to the terminal. Intelligent networks and smart cards will enable UMTS subscribers to access their own customised services over any locally available terminal, whether fixed or mobile, simply by entering a unique personal

identifier. This concept, known as “Universal Personal Telecommunications” is already under development in the international standards arenas and will be a key feature of the Third Generation networks, as will full interoperability with existing fixed and mobile networks. UMTS will allow users unhindered access to high-speed transmission of information, regardless of physical location.

Will I still be able to use my existing mobile phone?

2.15 From a users perspective, UMTS can be viewed as a compliment to existing services and technologies; for instance, as described in 2.5 above, multimode terminals will facilitate the provision of UMTS and existing services such as GSM and PCN via a single terminal, providing the user with seamless roaming between services. It is recognised that, for many users, the voice and data capabilities of GSM, DECT, ISDN and other existing technologies will continue to be adequate, just as the fixed PSTN continues to meet the needs of many of today’s subscribers. There are therefore no current plans to close these services. In the longer term, once UMTS services are fully established and if there is substantial migration to the new service, the future of the existing networks will be reviewed. Such a review will involve full consultation with both users and operators, as was the case with the decision to close First Generation analogue services by 2005, see also Chapter 8 below.

3 WHERE WE ARE NOW - A SUMMARY OF THE WORK GOING ON

3.1 The success of Second Generation mobile systems, in particular GSM, in gaining significant market penetration around the world, as well as meeting the wider customer expectations, has led to a situation where Third Generation mobile systems are expected to match the wideband capability offered by fixed services.

3.2 Work on Third Generation systems within the International Telecommunication Union (ITU) started some 12 years ago, and the European discussions within ETSI, UMTS Forum, and CEPT, as well as within the UK, have followed on since. This section outlines the current state of discussions within these fora.

ITU

3.3 The ITU is currently addressing the development of Third Generation mobile systems within the Radiocommunications (ITU-R) and Telecommunications (ITU-T) Sectors. Under the programme titled ‘International Mobile Telecommunications 2000’ (IMT-2000), formerly known as Future Public Land Mobile Telecommunications Systems (FPLMTS), it is developing recommendations to assist administrations with the development of Third Generation systems. The work of the ITU-R is expected to be completed around the year 1999.

ETSI

3.4 A major contribution to the world wide success of GSM was the development of detailed and comprehensive specifications within the European Telecommunication Standards Institute (ETSI). A similar activity has already commenced within ETSI for the development of UMTS standards. This should result in the development of the ETSI standards for UMTS consistent with implementation in or around the year 2002.

UMTS FORUM

3.5 The UMTS Forum was established following the European Commission's initiative on the UMTS Task Force and the final report of the Task Force. The main emphasis of the Forum is centred on Europe but it is open to participation from any country in the world. It was formally inaugurated as a non-profit making association under Swiss law on 16 December 1996. The UMTS Forum is an association of telecommunications operators, manufacturers and regulators active both in Europe and other parts of the world.

3.6 The DTI (Radiocommunications Agency and Communications and Information Industries Division) have participated actively in the establishment of the UMTS Forum which is expected to play an important role in the development of harmonised positions on UMTS across a wide range of European industry interests. It is hoped that this can develop on a more global basis for the future.

3.7 However, although the DTI has participated in the development of the Forum's report on the Regulatory Framework for UMTS and welcomes the preparation of the Report, the Government's policy on UMTS is not constrained by the report. The Forum's output will, however, be taken fully into account when developing the final regulatory framework for UMTS within the UK.

3.8 At present the UMTS Forum is concentrating its activities on the development of two specific reports:

- a Regulatory Framework For UMTS,
- UMTS Spectrum Requirements.

3.9 Set out below are some of the key recommendations made in the draft reports produced by the UMTS forum:

- that only ETSI defined UMTS will be used in frequency bands identified for UMTS,
- that the core bands for UMTS are those defined in the UMTS Draft ERC Decision,
- that the Draft ERC Decision on UMTS frequency bands should be made available for UMTS by 2005, and that 2 x 20 MHz is the minimum requirement per operator,

- that a further 160 MHz will be needed for UMTS by 2010 on a pan-European harmonised basis (and world-wide if possible),
- that the Licensing Directive and the draft Connected Terminal Equipment (CTE) Directive should also be applicable to the licensing and free circulation of equipment and systems within the EU,
- that spectrum should be segmented, i.e. exclusive allocations per operator, to encourage spectrum efficiency.

3.10 The UMTS Forum also proposes a development schedule for the first phase of UMTS as shown in the Table 1 below.

Task name	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
UMTS revised vision	■									
Co-operative research: ACTS	■	■	■							
Regulation: UMTS Forum report	■	■								
Regulation: EC, ECTRA measures		■								
Regulation: National licence conditions			■							
Regulation: Operators identified			■							
Operators commitment: Drafting		■								
Operators commitment: Signature			■							
ETSI: Basic standards studies	■	■	■							
ETSI: Freezing basic UMTS parameters		■								
ETSI: UMTS Phase 1 standards			■	■	■					
UMTS Phase 1: System development					■	■				
Pre-operational trials						■	■			
UMTS Phase 1: Planning, deployment					■	■	■			
UMTS Phase 1: Commercial operation							■	■	■	■

Table 1: UMTS Phase 1 Development Schedule.

CEPT

3.11 The Conference of European Post and Telecommunications (CEPT) with a membership of 43 Administrations, has examined the matters concerning Third Generation mobile communications with a view to adopting certain common European positions. The European Radiocommunications Committee (ERC) of the CEPT has developed a Decision identifying a total bandwidth of 155 MHz for UMTS within frequencies identified in the ITU Radio Regulations for IMT 2000. This is discussed further in Chapter 4 below. It is expected that this Decision will lead to the introduction of UMTS in harmonised frequency bands, not only within the Member States, but also more widely in Europe. CEPT/ERC is

also expected to prepare a Decision on the free circulation of UMTS mobile terminals, to facilitate roaming within Europe.

International aspects:

3.12 If IMT 2000, and UMTS as part of the IMT 2000 family concept, is to be a success then the positions, actions and ambitions, of other international players in Third Generation such as Japan, Korea, China, Canada and the US will play an important role. Within Europe there is an emerging consensus on an overall schedule for the implementation of UMTS. However this may not be consistent with other countries.

3.13 For example in Japan there appears to be a requirement for a more rapid deployment of a Third Generation system than in Europe to ease spectrum congestion in their Second Generation systems. There appears to be a requirement for a Third Generation system with access to a world-wide market and world roaming by the year 2000. However, due to the success of GSM, as the de facto global standard for Second Generation mobile communications, Europe and other countries around the world are not under such commercial and spectrum pressures and therefore a slightly later implementation date is envisaged in Europe. Initial rollout of UMTS networks and start of service is anticipated to be from the year 2002 onwards in Europe. It is considered that this would ensure that a true Third Generation system is realised.

3.14 There appear to be two main interest groups within the US in relation to the development of Third Generation systems. These are the adoption within the ITU of:

- the IS95 CDMA evolution air interface and the IS41 evolution network protocol,
- PCS 1900 as an evolutionary path from GSM towards Third Generation.

It is considered important that the development of, and the regulatory framework for, UMTS should take account of these aspects to ensure a Third Generation system with world-wide market access and true global service.

The work of the UK3GMG and subsequently the UK TAG group

3.15 The importance of the regulatory framework for UMTS within the UK was recognised some time ago and an industry led activity was established under the auspices of the DTI to consider the relevant issues. This was known as the UK 3GMG (UK Third Generation Mobile Group) and it developed a report *Implementing the UK Wireless Information Superhighway for Mobile and Personal Communications in the 21st Century*. This report was presented to the DTI in July 1996.

3.16 At this point, the UK 3GMG was considered to have completed its task and was dissolved. However one of the recommendations of the Group to the DTI was that a follow on group should be established to facilitate the introduction of UMTS and assist the existing standardisation activities. This resulted in the formation of the UK Third Generation Advisory Group (UKTAG), which is an industry-led group with government participation.

3.17 One of the first tasks of the UKTAG was to revise the original UK 3GMG report to produce an industry advisory document, *Developing Third Generation Mobile and Personal Communications into the 21st Century*, which was published for comment by the DTI in February 1997. The closing date for comments was 31 May 1997 and a total of 18 comments were received which are available for public inspection by contacting 0171-211 0502.

Overview of comments in response to Consultation

3.18 In general the advisory document *Developing Third Generation Mobile and Personal Communications into the 21st Century* was well received and seen as useful by those who responded. Those views and comments have been valuable in drafting this document.

3.19 A number of respondents were in favour of a smooth migration from GSM to UMTS to help build upon the success of GSM, while recognising that UMTS must be more than an enhanced Second Generation service. It was suggested that backwards compatibility for initial handsets might be of benefit, and help with coverage in the early stages of UMTS roll out or dual mode handsets. It was also suggested that the refarming of GSM spectrum might begin around in the years 2010 to 2015.

3.20 A common theme was the need for business to have certainty as to the licensing process for UMTS and what spectrum would be available. This certainty was seen as an important pre-requisite for potential operators to put together business cases to participate in the UMTS licensing process. There were also calls for the licensing process to begin next year.

3.21 It was also recognised that UMTS would require extra spectrum beyond the core bands identified in the draft ERC Decision. It was seen as important that more than the initial minimum of 2 x 30 MHz identified in the Decision be made available in 2002. The consensus was generally that the whole 155 MHz of terrestrial spectrum should be made available to UMTS by 2005, and that the extension band be available before 2010 and be of the order of 2 x 160 MHz. This is broadly in line with the UMTS Forum report. Concern was expressed that excessive spectrum “salami slicing” should be avoided due to the reduction in spectrum efficiency caused by trunking gain losses.

3.22 On the issue of the use of satellite the response was mixed. Some inputs were in favour of identifying extra spectrum for MSS below 3 GHz, some for identifying this spectrum well above 3 GHz, some for reducing the spectrum allocated below 3 GHz. Concerns were raised as to the relative spectrum efficiencies of terrestrial and satellite, and what the focus should be within Europe. The point was raised that terrestrial channels would be re-used a number of times within the UK, whereas this was not the case with satellite with its large footprints. However it was recognised that terrestrial UMTS would not be able to cover all regions of even a relatively densely populated country such as the UK.

3.23 Another issue raised was the ability of UMTS to offer the broadband services that will be expected in the next millennium. Specific reference was made to the possible use of Mobile Broadband System (MBS), which is being developed within RACE (an EU collaborative research programme). MBS is seen as a complimentary service to UMTS

offering data rates of up to 155 MB/s for small indoor cells, operating at frequencies around 40 and 60 GHz. It was suggested that work on this be brought forward to allow this complementary service to be available in timescales consistent with UMTS.

3.24 It was also suggested that a pre-UMTS trial programme should be established by interested parties.

3.25 On the amount of spectrum required by an operator and the number of operators who should be licensed, it was generally felt that the number of operators should be between 3 and 5, and that around 2 x 20 MHz was required to offer a national UMTS service. Although the possibility of having an initial allocation of 2 x 15 MHz with a further 2 x 5 MHz guaranteed later was also suggested.

3.26 On standardisation it was agreed that the UK should implement the UMTS standard developed by ETSI. There was however concern expressed as to whether the IMT-2000 standardisation effort will produce a meaningful global standard in the timescales proposed. It was further suggested that international standardisation might be best achieved through the GSM group of countries.

3.27 The suggestion was also made that UMTS might benefit from some common form of instruction protocol like JAVA. This would enable software other than the network operator's to be downloaded to terminals. This might allow innovative services to be developed by Third parties.

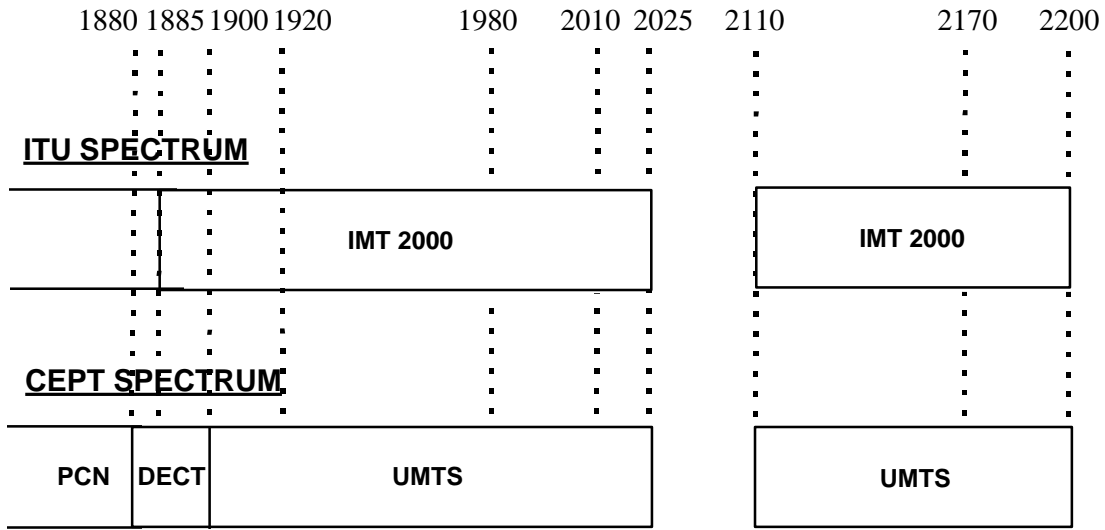
3.28 The UK TAG report and the comments received have made a significant contribution to the development of this document. The DTI will continue to fully support the work of UK TAG.

4 SPECTRUM ISSUES

4.1 The discussions within international fora, which started in early 1990, have led to the identification of spectrum for FPLMTS (now referred to as IMT-2000) by the World Administrative Radio Conference 1992 (WARC-92). The WARC-92 identified a total of 230 MHz of spectrum in the 2 GHz bands, on a global basis for terrestrial applications, with 60 MHz of this shared with the satellite component of IMT 2000. The CEPT has designated most of this spectrum for UMTS with the adoption of the ERC Decision on UMTS which identifies a total of 155 MHz of spectrum for terrestrial UMTS services with an additional 60 MHz for set aside for UMTS satellite services. The remaining 15 MHz of the total of 230 MHz identified by WARC-92, is made available to DECT within Europe and is therefore not available for UMTS applications at the present time. This is illustrated in figure 1 below. The spectrum identified for terrestrial UMTS by the ERC allows for 2 x 60 MHz of paired spectrum and 35 MHz of unpaired spectrum. This is illustrated in figure 2 below.

4.2 The following discussion relates to the spectrum issues on terrestrial UMTS and not to the spectrum identified for the satellite component of UMTS. References to spectrum on the satellite component of UMTS are clearly identified.

2GHz SPECTRUM (MHz):



KEY

TERRESTRIAL APPLICATIONS

SATELLITE APPLICATIONS

Figure 1: The IMT 2000 / UMTS Spectrum

Operator requirements

4.3 The amount of spectrum required for each operator to offer UMTS services has been discussed in numerous fora, including the UMTS Forum. This figure has been estimated as 2×20 MHz. All operators to be licensed to offer UMTS are expected to need access to a minimum amount of spectrum to be able to provide services on a nation-wide basis. Therefore, the available spectrum will be a fundamental factor in determining the number of operators to be licensed to offer UMTS in the UK.

4.4 Given the amount of spectrum available for the implementation of UMTS and the spectrum requirement identified for each of the operators, the Government’s initial thinking is that the number of operators, and therefore the number of licences issued for UMTS, should be at least three. The Government also believes that all of the spectrum identified for the terrestrial component of UMTS should be offered to UMTS operators, except for any spectrum that may be set aside for “deregulated high data rate wideband applications”. All of the spectrum to be offered to operators, apart from any spectrum for deregulated high data rate wideband applications, would be an obvious potential candidate for auctions (see Chapter 6). The Government does not intend to auction the spectrum identified for the satellite component of UMTS.

4.5 **Comments are welcomed** on the appropriate number of licences, the minimum amount of spectrum required for each operator and whether each operator requires the same amount of spectrum. Clearly if one operator wins more than one third of the spectrum which is available (if say three licences are available), or settles for less, then there will a correspondingly different amount available pro rata for the other operators. See also Chapter 6. **Comments would also be welcomed** as to whether spectrum should be made available nationally or on a regional/geographic basis reflecting the likely intensity of use.

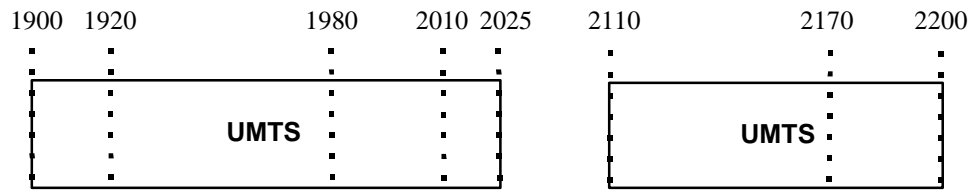
4.6 The use of the 155 MHz of available spectrum should be carefully planned to offer the maximum benefits to UMTS. The planning of the spectrum is further discussed in the sections below.

Planning of the UMTS spectrum

4.7 In order to promote competition and provide sufficient spectrum for UMTS, it is proposed that all the 155 MHz identified for UMTS in the ERC Decision should be made available in one stage. The Government will make every effort to ensure the timely migration of existing services from the UMTS spectrum to facilitate the introduction of UMTS. However, there may be certain instances where such migration is not possible, and in such cases the possibility of sharing between the existing systems and UMTS will have to be assessed prior to the introduction of UMTS. **Comments are welcomed** on the proposal to make all of the spectrum identified for UMTS available in one stage.

4.8 One possible planning scenario would be based on the principle that all of the available spectrum should be used by the UMTS operators for full mobility applications. This implies that deregulated high data rate wideband applications, where possible, should be limited to frequencies outside the bands identified for UMTS. Another scenario is that UMTS spectrum should also be used for deregulated high data rate wideband applications as well as by the UMTS operators. These two scenarios are further discussed below and shown in figure 2. Other planning scenarios may offer similar benefits. **Comments are welcomed** on the planning of this spectrum.

CEPT UMTS SPECTRUM (MHz):

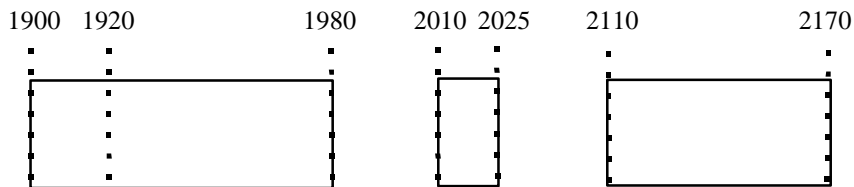


KEY

TERRESTRIAL APPLICATIONS

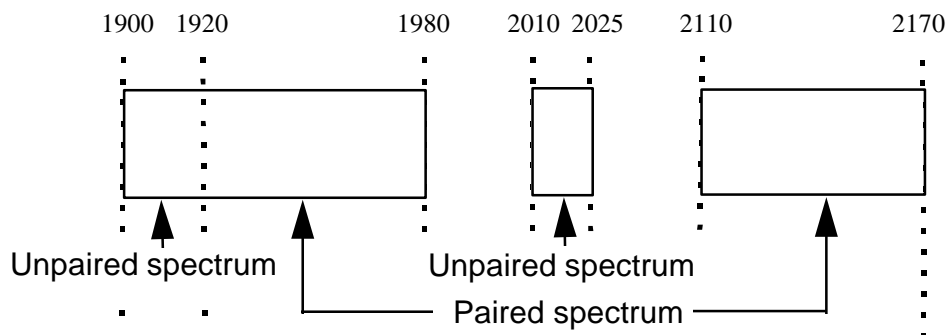
SATELLITE APPLICATIONS

SCENARIO 1:



The UMTS terrestrial spectrum 1900-1980 MHz, 2010 - 2025 MHz & 2110 - 2170 MHz available for UMTS terrestrial operators

SCENARIO 2:



The UMTS terrestrial spectrum 1920 - 1980 MHz, 2010 - 2025 MHz & 2110 - 2170 MHz available for UMTS terrestrial operators and the spectrum 1900 - 1920 MHz available for deregulated high data rate wideband applications.

Figure 2: Planning of the UMTS spectrum - scenario 1 & 2.

Scenario 1

4.9 The discussions in many fora suggest that there will be a growing demand for spectrum for UMTS full mobility applications following the implementation of systems in the year 2002. This places a greater obligation on administrations to ensure that the use of the currently available spectrum is maximised to realise the full potential of UMTS. In such cases, a higher priority may be placed on the spectrum requirements for full mobility applications than that for deregulated high data rate wideband applications. This will lead to the identification of all available spectrum for full mobility applications. If a total of 155 MHz is available for UMTS, and there were three operators, this approach would give each operator about 50 MHz of spectrum, either contiguous or non-contiguous, with some spectrum being set aside for guard bands at band edges. **Comments are sought** on this scenario as well as the spectrum identification for each of the operators.

4.10 The deregulated high data rate wideband applications, are of course, considered to be an integral part of UMTS and essential for indoor applications, which provide for seamless UMTS service availability. However, in view of the limited spectrum and capacity available, such applications should be offered at higher frequencies, say above 3 GHz. This might also provide some synergy with systems which offer data rates higher than 2 Mbits/s and would be more in keeping with the high data rates offered in LANs. If the deregulated element were to be placed in spectrum above 3 GHz this would suggest that UMTS licensees will not be permitted to use their bands to provide this type of high data rate indoor service. **Comments are sought** on the suitability of other frequencies for such deregulated applications, especially those at higher frequency bands, e.g. millimetre waves. This is discussed further in Chapter 8.

Scenario 2

4.11 The other scenario is to identify the available spectrum as paired and unpaired bands, and make both types available to operators, whilst identifying a part of unpaired bands for deregulated high data rate wideband applications. This is further illustrated below.

4.12 The paired spectrum is identified as 1920 - 1980 MHz and 2110 - 2170 resulting in the unpaired parts as 1900 - 1920 MHz and 2010 - 2025 MHz.

Paired spectrum The 2x60 MHz (1920 - 1980 MHz and 2110 - 2170 MHz bands) of paired terrestrial spectrum is seen as a candidate band to be segmented between operators. The number of operators to be supported within this paired spectrum would depend on the spectrum requirements per operator and whether each of the operators requires the same amount of spectrum. If each operator requires a 2x20 MHz bandwidth to offer UMTS services, for example, then this amount of spectrum would allow for three operators. It is envisaged that this spectrum would be used primarily for wide area UMTS services, providing for full mobility applications, mainly using Frequency Division Duplex (FDD) technology, but without precluding the additional use of Time Division Duplex (TDD) technology when necessary. This spectrum would be an obvious potential candidate to be subject to auctions. **Views are sought on the planning of this portion of the UMTS spectrum.**

Un-paired spectrum The 15 MHz (2010 - 2025 MHz band) of unpaired spectrum to be made available on an equal basis to all UMTS operators. This spectrum could be either divided, on an equal basis, or shared amongst the operators. It is envisaged that this spectrum would be initially used with TDD technology for localised UMTS applications. It should be noted, however, that in the longer term this band may be used for FDD technology if the frequency band 2200 - 2215 MHz is also made available as a part of an extension band for UMTS, as has been tentatively suggested in various fora. It is anticipated that this spectrum would also be a potential candidate to be auctioned as a part of the 'package' along with the paired spectrum. **Views are sought on the planning of this portion of the spectrum.**

The remaining 20 MHz (1900 - 1920 MHz) of unpaired spectrum could be made available for all users for deregulated high data rate wideband applications such as cordless UMTS, PABX UMTS, for indoor applications etc. It is envisaged that a deregulated band, as implied, would provide for high data rate (for example 2 Mbits/s) indoor or localised UMTS applications using TDD technology. It is anticipated that this spectrum will not be considered for auction. **Views are sought on the planning of this portion of the spectrum.**

4.13 It is important to note that frequency guard bands may be required between UMTS and adjacent band services to prevent interference. This may mean that a small amount of the spectrum at the edges of the UMTS spectrum will not be available for UMTS services.

4.14 It has also been suggested that the duplex separation for UMTS be reversed. Conventionally the mobile transmit band is in the lower part of the duplex, and the base transmit in the upper part. The suggestion here would be to have the base transmit band in the lower band 1900-1980 MHz. This could be of benefit if the traffic supported by UMTS is asymmetrical (e.g. mobile user receives more data than he normally transmits). This might also be of benefit in reducing band edge compatibility problems with GSM/PCN. **Views on this would be welcomed.**

Harmonisation

4.15 The availability of common frequency bands on a world-wide basis would assist the global mobility of Third Generation mobile terminals. This would also assist in reducing equipment costs. Such harmonisation within Europe is considered to be of paramount importance. It is expected that the implementation of the ERC Decision on UMTS by CEPT administrations would enable this harmonisation.

4.16 The identification of spectrum for deregulated high data rate wideband applications outside the frequency bands available for UMTS will require harmonisation, where possible on a world-wide basis, and whichever the case, on a European basis.

Existing Users within the bands identified for UMTS

4.17 There are radio services, mainly fixed links, currently using the spectrum identified for UMTS. It is intended that the majority of these will be migrated before UMTS commences service in the year 2002. Transhorizon links, which also operate within the bands identified

for UMTS, are not expected to migrate within the time frame mentioned above, however, it is intended that the future of these, which are mainly in remote areas, will be reviewed periodically to determine if UMTS is being unduly constrained and whether the transhorizon links should be migrated in the longer term.

4.18 The ERC Decision on UMTS and other associated ERC Decisions have identified the bands 1980 - 2010 MHz and 2170 - 2200 MHz for the satellite component of UMTS. However, it has been suggested that the feasibility of sharing within these bands between satellite and the terrestrial components of UMTS should be assessed, specifically targeting the indoor use of UMTS. Given the limited availability of spectrum for satellite services it is noted that the use of this spectrum for other UMTS applications should not constrain the satellite services.

Spectrum Sharing

4.19 There is no clear consensus on the question of sharing of spectrum between operators. On the one hand, sharing may be sensible if it allows operators the potential to improve overall spectrum efficiency. On the other hand, this concept has not been demonstrated, especially the arrangements for providing guaranteed equal access to a common pool of spectrum for a number of operators. In a shared environment all operators suffer when congestion arises, making it difficult for competing operators to determine their own service quality. There could well be concern if, for example, one operator were to decide to offer free or very low cost services leading to severe congestion of the network denying others access to spectrum. By contrast in a partitioned spectrum environment, this would only affect the operator concerned.

4.20 A degree of sharing might be appropriate in the unpaired spectrum. Because of the very localised way in which this spectrum might be used, a common pool might make sense: indeed, this is already the way the DECT cordless spectrum is used. **Views are sought** on whether Third Generation licensees should be required to enter into spectrum sharing arrangements.

Pricing of spectrum within the framework of the Wireless Telegraphy 1997 Bill

4.21 The Government intends to make the UMTS spectrum available using the powers provided in the Wireless Telegraphy Bill 1997, which it is hoped, subject to Parliamentary approval, will become law in time for the licensing of UMTS. The current preferred method is by spectrum auctions which is discussed further in Chapter 6. The allocation of licences through auctions will, however, need to be carefully considered. It is the aim of the auctions to provide a fair and transparent mechanism for licence allocation and to promote spectrum efficiency. The procedure will also need to ensure that any potential winner of an auction is sufficiently capitalised to meet all the conditions of a Telecommunications Act licence, such as coverage and dropped calls. Clearly it is not in the interest of spectrum efficiency for UMTS spectrum to be left vacant by a successful bidder because they cannot adequately fund their roll-out (see also Chapter 6).

Future requirements up to 2010

4.22 The success and therefore the growth of Third Generation or UMTS is forecast by many industry commentators, and it is anticipated that additional spectrum for UMTS will therefore be required in due course. It is preferred that any additional spectrum for Third Generation should be available on a global basis but if this is not possible, then it should at least be common throughout the CEPT. The subject of additional spectrum for Third Generation will be addressed at future World Radiocommunications Conferences (WRC) held by the ITU. The CEPT, having taken note of the requirement for additional spectrum has already proposed the inclusion of this item on the agenda of the WRC to be held in 1999. Once the spectrum is allocated at the WRC, it is expected that CEPT would take further action to harmonise its availability within the required time scale. This is further addressed in Chapter 8.

5 STANDARDS ISSUES

5.1 On the basis of the GSM experience it is considered that standards will play an important role in the development and implementation of Third Generation systems, and it is the Government's intention that the UK implementation of UMTS will be based on strict adherence to the emerging ETSI standards. Since it is expected that UK Third Generation Operators' licences will have licensing certainty during the next financial year, it will be necessary for licensed operators to undertake to apply the agreed ETSI standard retrospectively to any equipment produced not fully in accordance with the final standard.

5.2 It is the Government's view that the development of Third Generation system standards should not be just an evolution of the existing Second Generation systems. However it is appreciated that a suitable migration path from Second to Third Generation systems will be required.

5.3 GSM began life as a Pan-European system developed in Europe and later expanded to cover vast numbers of countries throughout the world. Third Generation systems such as UMTS on the other hand are intended to embrace the global concept from the outset. The development of UMTS standards within ETSI therefore needs to address this issue as a starting point in its deliberations.

5.4 The current ETSI strategy is to position UMTS as an implementation of IMT 2000. This is known as the IMT 2000 family concept. The Government considers that this is an extremely important approach since it should allow ETSI to develop detailed specifications for UMTS under the European standardisation process but still maintain compatibility with the IMT 2000 Recommendations which will be developed in the ITU and provide a framework for global compatibility. This should also ensure that the ETSI views are well reflected in the ITU process and that there is a world market access for UMTS as it will form part of the ITU Recommendations. However considerable effort will be required by the UK, CEPT and ETSI to ensure that the ITU Recommendations fully reflect UMTS.

5.5 The Government fully supports the ETSI approach to UMTS standardisation and will work actively to ensure the success of this process. The UMTS Phase 1 standards, presently being developed by ETSI, are the basis for development of wideband functionality by 2002. This is shown in the table in Chapter 3. A second phase of UMTS, extending its wideband capabilities, is being considered for the 2010 time frame. The further evolution of UMTS is the basis for mass commercial use in the later years.

5.6 The timetable for ETSI indicates that radio interface selection is due to occur in December 1997, with the basic parameters set by the first quarter of 1998. The standard adopted by ETSI for UMTS will have a major impact on how spectrum is allocated to UMTS, in particular the channel bandwidths.

6. LICENSING POLICY AND AUCTIONS

6.1 The likely Third Generation market has been discussed in Chapter 2. Third Generation networks could be used in conjunction with existing GSM/PCN services as an overlay, complementary to the services which are already provided on those networks, particularly voice telephony. Third Generation could equally be used to complement the fixed telecommunications market, facilitating convergence between fixed and mobile networks. Either of these scenarios could meet consumer demands; in practice both are likely to emerge.

6.2 To date, a comprehensive rule-based regulatory regime has been in place through Telecommunications Act licences which have controlled imbalances of market power and the ability to act anti-competitively. However, competition is developing and it is time to look in the future at market opening measures aimed at removing barriers to entry to encourage competition across the converging fixed and mobile markets, rather than market entry restrictions. This chapter sets out the Government's proposals for prospective Third Generation operators to obtain spectrum and Third Generation licences. The following chapter sets out the main regulatory issues relating to the licensing of Third Generation operators.

Eligibility to Bid

6.3 It was announced last year that no reason was foreseen why the existing four mobile phone operators in the UK, namely Vodafone, Cellnet, One 2 One and Orange, should not be free to compete with other operators for a licence to operate Third Generation mobile telecommunications services. The existing four operators, with their developed Second Generation networks offering economies of scale, growing customer base seeking further multimedia services, and experience in the provision of mobile services, are likely to be strong contenders in any forthcoming competition. The Government recognises that there may be implications for competition (see chapter 2). It therefore **invites views** both on the risks posed by the relative competitive advantages or disadvantages of the various operators to the development of an open competitive market, and on how those risks might be minimised.

6.4 On the question of whether BT should be allowed to bid, it is recognised that there is scope for meeting customer demands by using Third Generation to complement services provided over fixed networks. This would meet pressure to offer converged services and would reflect the growing trend towards personal and terminal mobility. Telecommunications users value the freedom offered by services on the move and the Government does not wish to leave that demand unsatisfied by over-regulation. However, given the continuing disparity between BT's share of the market and that of its competitors, it is clearly important for the future of telecommunications competition that the decision on BT's eligibility to bid is given careful consideration. The Government considers that BT will continue to have market power in the fixed market which, together with its position through Cellnet in the mobile market, could potentially be used anti-competitively in the converged fixed/mobile market. However, given that licences will contain effective provisions to address anti-competitive behaviour (see Chapter 7), and bearing in mind that we are looking at the market some four to five years ahead, when Third Generation services begin to be rolled out, it is the Government's view that BT should be allowed to bid either individually or as part of a consortium including Cellnet. **Views are invited** on what competition issues might arise from BT's participation in any Third Generation competition.

Consortia Bids

6.5 The possible Third Generation market structure described in Chapter 2, envisages a service provision approach where a content provider would sell services to customers through a service provider who would use the facilities of a network operator which has its own spectrum. This multi-level approach is one on which **we would welcome views**.

6.6 There should be scope for collaboration between operators bidding for spectrum as consortia as long as this does not lend itself to anti-competitive practices or concentrations of market power which act against an open and competitive market. The Government proposes, therefore, not to place any restrictions on individual companies or consortia bidding for a Third Generation licence, subject to their being able to satisfy the pre-qualification criteria which will form part of the proposed licence auction process. This process is described in greater detail in this Chapter below. An important aspect of the pre-qualification criteria will be the need to maintain effective competition. Fair trading and competition issues would arise if the same company successfully bid as part of more than one consortium for a Third Generation licence. It is likely therefore that the Government, in establishing these criteria will require that any member of one Third Generation consortium should not be part of any other Third Generation consortium.

6.7 Since the mobile market in the UK has flourished from strong competition, benefiting consumers through lower charges and improved services, the Government would particularly welcome and encourage applications from qualified new entrants to the UK mobile communications market.

6.8 The award of Third Generation mobile licences to provide multimedia mobile services well into the next century is a major development in the rapidly growing UK telecommunications market. Although, as indicated above, any qualified company will be eligible to apply for a licence, the Government believes that companies will see merit in forming consortia in their approach to the forthcoming competition. A consortium is likely

to be able to offer greater opportunity to put together a balanced mix of companies with experience in not only the provision of mobile telecommunications services but also, in view of the strong trend towards convergence between telecommunications and multimedia, experience in fixed telecommunications together with the provision of multimedia and IT services to consumers. **The Government would particularly welcome comments** on these proposals from all sectors of the Information Society.

Roll-out and Coverage Obligations

6.9 All mobile phone operator licences awarded in the UK over the last twelve years have included suitable roll-out and coverage obligations. The two most recent licences awarded to One 2 One and Orange in the early 1990s followed those of Vodafone and Cellnet, awarded in the mid 1980s, in requiring 90% coverage of the population. In the case of the One 2 One and Orange licences, this coverage obligation was accompanied by a roll-out obligation of 31 December 1999, i.e. some six years after the expected commencement of commercial services. Three of the four mobile phone operators have achieved the 90% coverage target well ahead of the deadlines set in their respective licences, and One 2 One is expected to achieve its target later this year- two years ahead of its deadline. The Government recognises and pays tribute to the vigour and determination of all four operators, not only in the early achievement of the targets set in their licences, but in pressing on with the development of their networks. Vodafone and Cellnet have now achieved over 97% coverage of the population, which represents a very mature network by any standard, whilst Orange and One 2 One are also aiming for similar coverages in the not too distant future.

6.10 Extension of coverage beyond targets set in the licences is strongly driven by the need to extend the services offered to customers and maximise market share. Network coverage is clearly a matter of competitive advantage and no operator can afford to rest on its laurels. The Government therefore considers that there is no need to intervene to set exceptionally high coverage obligations, since vigorous competition already achieves this objective. Rather, licences should set a minimum acceptable coverage and roll-out obligation consistent with the efficient use of spectrum and the need for an operator to provide a reasonable level of service to its customers. Beyond that point it is right for operators to strike the right balance between competitive advantage and meeting customers needs on the one hand, and the commercial merits of extending coverage into lower population density areas where the business case may be less compelling, on the other.

6.11 In determining an appropriate roll-out and coverage obligation for Third Generation, consideration needs to be given to the technical differences between Second and Third Generation technologies. Due to the much higher data rates required to deliver the full-range of multimedia services, the working range of terminals is likely to reduce and consequently cell sizes become smaller in Third Generation networks. This adds to infrastructure costs. In cities and other densely populated areas, this is not likely to pose a serious problem since Second Generation cell sizes are already small and the trend is towards ever smaller cell sizes of a few hundred metres or less in order to develop the networks to the maximum possible capacity. However, in some urban and more rural areas, infrastructure costs of Third Generation networks are likely to be significantly more expensive than Second Generation, reducing their overall profitability, particularly if full multimedia services are provided. The ETSI UMTS standard provides for terminal data rates between 144 kbits/sec wide area

cellular, to 2 Mbits/sec true wideband for short range and indoor applications. Whilst the Government wishes to encourage operators to provide wide area networks capable of delivering multimedia services at the highest possible data rates possible, it is recognised that this is largely a matter for the operator's commercial judgement. As indicated above, a rollout and coverage obligation for inclusion in a licence is intended as the minimum reasonable level of service for consumers. Therefore, it is proposed that the rollout and coverage obligation should be based on the wide area cellular UMTS environment i.e. a data rate of 144 kbits/sec.

6.12 Taking all these considerations into account, the Government considers that an appropriate rollout and coverage obligation for inclusion in Third Generation licences should be 80% of the population within six years of commencement of commercial services. If operators are provided with licensing certainty during the next financial year, with commercial services expected to start by 2002, the latest date for achieving 80% coverage of the population would therefore be 31 December 2007. **Comments would be welcomed on this proposal.**

Achieving Greater Coverage for Third Generation

6.13 As indicated above the proposed rollout and coverage obligation for inclusion in a licence is a minimum and it is expected that operators will, as previously, well exceed this target. A number of ways have been discussed in international fora to lower the cost to individual operators and increase the percentage of coverage which they can provide. Spectrum sharing has been considered in Chapter 4. Other proposals divide into three main areas which are considered further below:

- infrastructure sharing,
- national roaming agreements,
- UMTS satellite coverage.

Infrastructure sharing

6.14 There are several possibilities for infrastructure cost sharing between operators ranging from shared masts, to shared radio equipment on mast sites, and the associated backhaul network. For environmental reasons, the Government strongly encourages the erection of antennas on existing masts - also on buildings or other structures - where possible, and will expect 3rd Generation operators to develop this approach. Obligations concerning mast sharing are set out in Schedule 4 to the Telecommunications Act licence dealing with Code Powers, which are considered further in Chapter 7 below.

6.15 On the sharing of other physical infrastructure i.e. radio equipment and backhaul circuits, there are no restrictions in the UK on operators entering into sharing agreements to reduce their costs and extend their networks provided that such agreements are in accordance with UK and EC competition law. Since the UK telecommunications market has, however, significantly benefited from the development of competing telecommunications infrastructure,

rather than from providing competing operators equal access to a single or limited telecommunications infrastructure, the above proposed roll-out and coverage obligation will require operators to meet the target using their own telecommunications infrastructure (excluding sharing masts or mast sites) rather than shared telecommunications infrastructure. The Government recognises that the roll-out of Third Generation multimedia services into relatively low teledensity areas, well above the 80 % coverage obligation, may well depend on operators entering into appropriate infrastructure sharing arrangements with each other, and would encourage such proposals in order to extend the benefits of Third Generation services as widely as possible.

National Roaming Agreements

6.16 All four UK mobile phone operators are actively entering into roaming agreements with GSM and PCN operators in many overseas countries, to the significant benefit of their customers who are able to use their phones in many other countries around the world. This trend is likely to continue as more and more countries adopt GSM or PCN technology and dual band phones become established. For commercial reasons the four mobile operators have in the past been largely unwilling to enter national roaming agreements with each other i.e. allowing a customer of one operator to use another operator's network anywhere within the UK. The Government is disappointed that UK mobile consumers as a whole are denied the opportunity to communicate in the UK, if for any reason a link cannot be established with the customer's own network.

6.17 Whilst recognising that continued vigorous competition is a major strength of the UK mobile phone environment, the Government nevertheless considers that all four operators should now actively review whether it is time to negotiate national roaming agreements for their GSM and PCN networks in the light of dual band phones becoming established and the fact that all four networks are approaching similar levels of coverage across the UK.

6.18 Since the four networks can never have exactly the same coverage everywhere, national roaming between them offers a clear benefit to all their customers which should override narrow commercial considerations. Furthermore, irrespective of whether existing operators are awarded a Third Generation licence, as indicated in Chapter 2 above, Third Generation services are likely to be provided in conjunction with existing GSM/PCN services using multi-mode terminals. There will therefore clearly be significant advantages to consumers if roaming between Second and Third Generation networks is possible. **Views on this would be welcome.**

6.19 The launch of Third Generation services, however, offers an opportunity for the successful licensed operators to enter into national roaming agreements for these services from the start. National roaming between all Third Generation licensees will enhance the early take up of Third Generation services. Whilst all Third Generation licensees can be expected to rapidly set up networks within the M25 and other major cities, the provision of Third Generation services in the regions will be very patchy for some time, even for operators who win a Third Generation licence who already have an existing Second Generation network.

6.20 The Government considers that all Third Generation customers will clearly benefit from the ability to roam nationally to obtain the widest possible service. In addition national roaming between all Third Generation operators overcomes a major competitive advantage that existing Second Generation operators may have if they are awarded a Third Generation licence. It reduces a significant barrier to entry of new operators associated with the Second Generation operators' existing mast sites and infrastructure. Without roaming, it could take a new operator, who wins a licence, several years to acquire sufficient mast sites to provide a reasonable degree of national coverage. It is considered therefore that the introduction from the start of national roaming between Third Generation operators is needed to promote full competition and to ensure that consumers in particular get the best possible Third Generation service from the outset. The Government therefore proposes to include provision in Third Generation licences to ensure the early efficient and effective introduction of Third Generation national roaming, with open and fair rules for charging, which would be referred to OFTEL in the event of dispute. **Comments would be welcome** on this proposal.

UMTS Satellite Coverage

6.21 Mobile satellite networks are likely to play an important role in the universal delivery of Third Generation multimedia services, and the definition of UMTS spectrum clearly identifies a satellite component to be operated alongside the terrestrial component. This document does not address the licensing of Third Generation UMTS satellite operators. However, it is likely that such operators will be operational in the early years of the next century, providing at least 144 kbits/s multimedia services world-wide. The performance of hand-held UMTS satellite terminals is not expected to match their terrestrial counterpart in terms of capacity, power consumption, use inside building, or on price.

6.22 In a relatively densely populated country such as the UK, UMTS satellite services are therefore unlikely to be much used in the city and urban environment. UMTS satellite services are, however, likely to play an important role in extending UK Third Generation coverage to the more remote rural areas, i.e. the sparsely populated areas well outside those areas where 80% of the population of the UK live. Therefore, the satellite component of UMTS, whilst an important element of the system, should not count towards achieving the rollout and coverage obligation set out above which is in respect of each individual operator's own UMTS terrestrial network.

Regional Licences

6.23 The Government wishes to see the widest possible deployment of competing Third Generation multimedia services across the UK and considers that the UK mobile telecommunications market has enormously benefited from strong competition between four national rather than regional Second Generation operators. It is considered that the award of regional licences could not only restrict the number of national operators but also largely sterilise the use of the regional spectrum in areas where no regional candidate came forward. These areas are likely to be the less densely populated areas outside the M25 and the other main cities where the business case is less compelling. In the interests of maximising benefits to customers and utilising to the full the scarce UMTS spectrum which is available, the Government's initial thinking is that national, rather than regional Third Generation licences should be offered.

6.24 This would not, however, prevent operators from forming multi-regional consortia which might ably meet the needs of the market. The members of such multi-regional consortia would need to co-operate to provide a national service whilst being able to retain a regional identity, perhaps complementing existing fixed regional networks. Such an approach, whilst offering the prospect of competition to a national operator, would also need to meet the same rollout and coverage obligations as a national operator. It is therefore envisaged that such a consortium would constitute itself as a single licensee and therefore compete for one of the national Telecommunications Act and Wireless Telegraphy Act licences expected to be available. If not all the available UMTS spectrum is required by the national or multi-regional licensees, the Government would be prepared to consider the award of regional UMTS licences in certain areas, once national spectrum allocations are settled.

The Advantages of Auctions

6.25 There are increasing demands for spectrum and its use underpins some substantial industries. As a result, new tools for spectrum management are needed to meet these increasing demands and auctions are one of these tools. Auctions do not suit all cases (e.g. where the number of bidders is equal to or less than the number of items available) but they achieve market prices, are open and transparent, provide market information and are economically and administratively efficient. A carefully designed and properly run auction, with well informed bidders, can make the spectrum available to the user or users who value it most and who will maximise the economic benefit from its use.

6.26 Moreover, auctions overcome the difficulties, time delays and possible controversy inherent in the “beauty contest” approach. Taking account of all the relevant considerations, it is considered that an auction is likely to be the fairest and most effective way of assigning licences for Third Generation mobile operators.

6.27 There has been experience of auctions in other countries, notably Australia, New Zealand and the USA. There is extensive literature on different types of auction but there is a growing consensus that, in many circumstances, the simultaneous multiple round auction, pioneered by the FCC in the USA, is the most effective. Notable characteristics of this kind of auction are that all lots remain open until there are no more bids, that bidders have full information about the progress of bidding for all lots, and can therefore develop their strategy as the auction develops. This type of auction has many advantages. For example, it permits aggregation (for appropriate kinds of licences), and results in similar prices for similar kinds of licences. Software for running a simultaneous multiple round auction is also readily available. Other kinds of auction can be suitable in certain circumstances e.g. if there are only a small number of bidders a sealed bid auction (single round or multiple round) may be appropriate. A royalty auction, where payment takes the form, in whole or in part, of a percentage of qualifying revenue rather than a lump sum may have advantages in some circumstances where there is a high degree of market risk, as they effectively allow the bidders to share the uncertainty with the Government, and therefore serve to encourage new entrants. Decisions on the optimum auction mechanism will need to take account of the emerging picture on the likely number of bidders and the number of spectrum packages available.

The Licensing Process

6.28 As indicated above, a Third Generation operator will need a Wireless Telegraphy Act licence and a Telecommunications Act licence to establish and use a Third Generation network in the UK. Following this consultation, and further consultation as necessary with industry, and subject to the passing of the Wireless Telegraphy Bill 1997 currently before Parliament, it is expected that Wireless Telegraphy Act licences will be made available by auction.

6.29 The steps involved in the licensing process will include:

- Decisions, in the light of responses to this document, on **spectrum to be made available** and its packaging. This will include such matters as maximum permitted holdings of spectrum by one operator, number of licences (and whether regional or national) and technical standards (these aspects of spectrum availability and packaging are discussed in chapters 4 and 6 above). The licence duration is an important factor in any auction. The requirement of the operator to make a satisfactory return on his investment needs to be balanced against the need not to prevent alternative new mobile technologies to develop which may provide improved services to the mobile market and make more efficient use of the scarce spectrum resource in future years. **Views are invited** on a licence duration of 15 years from award of licences, and also on how the spectrum should be divided for auction purposes. For example should national licences for, say, 2x20 MHz of spectrum be offered, or would it be better to auction small packages of say, 5 MHz, allowing bidders to aggregate spectrum, subject to the setting of limits on maximum holdings? The latter would effectively allow the market to decide how the spectrum should be packaged and the amount necessary to provide the required service coverage. This issue is also discussed in Chapter 4 above. **Views are also invited** on whether reserve prices should be set and whether they should be disclosed to bidders.
- Decisions on **pre-qualification requirements** to be applied to applicants, for instance with regard to financial viability, and technical fitness. As a minimum the financial viability of potential bidders should be tested alongside a confirmation that they could in principle be awarded Telecommunications Act and Wireless Telegraphy Act licences. Deposits may also be required (which might be forfeit as fines for violation of auction rules if necessary). **Views are invited** on the need for further pre-qualification requirements.
- Campaign to publicise decisions on the above matters and encourage interest in, and bidders from, world-wide/European radio community. **Views are sought** on the information potential bidders would like to be made available at this time and the nature of the “due diligence” process.
- Decisions on **auction design and detailed activity rules**, in the light of information on potential bidders. Following publication of a bid package the auction process requires sufficient time for bidders to understand the rules, assess their bidding strategy, and consult with sources of finance and other advisors. It is proposed that at least 60 days should elapse between publication of a bid package and commencement of an auction.

During the auction itself, if it is multiple round, sufficient time is needed between rounds for bidders to reassess their positions, consult advisors and work out new bids. **Views are sought** on the most appropriate auction design for Third Generation mobile, detailed activity rules and, if multi-round auctions are appropriate, on the appropriate time delays between rounds.

- **Publication of bid package** (this will include specimen Wireless Telegraphy Act and Telecommunications Act licences, information on obligations that will be placed on licence holders, for example with regard to roll-out of services, spectrum available for all licences on offer, details of all incumbents, arrangements for, method and timing of payment and design of auctions and activity rules etc.).
- A formal **mechanism for responding to supplementary questions** on bid package from potential bidders as they exercise due diligence.
- Submission of applications for pre-qualification.
- Notification of successful pre-qualifiers.
- Start date of auction.
- End date of auction.
- Payment (various timing options e.g. immediately after an auction or staged, or royalty payments determined by a “royalty auction”)
- Public consultation on the Telecommunications Act licences to be awarded to the winners of the auction.
- Issue of Telecommunications Act and Wireless Telegraphy Act licences.

Other Auction Issues for Consideration

6.30 It is proposed to use the type of auction determined as optimum to make available licences for paired and unpaired spectrum for provision of national services. There is a need for further consideration to determine the position of the issue of licences, either separate or as part of national licences, to provide services in the Channel Islands and Isle of Man separately or as part of national channels.

6.31 There is much work that needs to be carried forward both within Government and on the part of potential bidders to run a successful auction. Decisions on procedures to be followed will need to take account of the picture that emerges from consultation on the extent of industry interest in applying for Wireless Telegraphy Act licences.

7 REGULATORY ISSUES

Third Generation Licences

7.1 Successful operators applying for a Third Generation licence will be required to provide services to a wide range of businesses and individuals. They will therefore be issued with a Public Telecommunications Operator (PTO) licence similar to those of the four existing mobile phone (Second Generation) operators. The Government will, however, need to ensure that any licences issued will be consistent with the EU's Licensing Directive and the Directive on provision of Mobile Services.

7.2 One option which would be suitable if responses to this consultation suggest that the Third Generation market is likely to resemble the existing GSM market, would be to give new Third Generation operators PTO status. This includes a number of obligations and conditions under section 8 (1) of the Telecommunications Act. These include conditions such as the provision of directory information, public emergency 999 and 112 call services, planning and implementation of special arrangements for emergencies, requirement to provide connection services, connection of other systems and apparatus, provision by others of services by means of the applicable systems, publication of charges, terms and conditions to be applied, and prohibition on undue preference and undue discrimination. The Fair Trading Condition, which is about to be inserted in Second Generation operators licences to prevent anti-competitive behaviour, will be included in Third Generation licences. The Fair Trading Condition, which is triggered by operators in a dominant position, applies simple rules to prohibit anti-competitive behaviour, according to its economic effects rather than its form, based on well known competition principles.

7.3 As indicated in Chapter 6, it is the Government's intention, as with all major users of scarce radio spectrum, to impose a coverage and roll-out obligation which requires Third Generation licensees to roll out a Third Generation network to an area where 80% of the UK population live within six years of commencement of commercial services. The obligation will either be in the Third Generation Telecommunications Act licence or in the Wireless Telegraphy Act licence (and cross-referred in the Telecommunications Act licence). In addition, the new numbering condition(s) will provide for mobile number portability and also, as indicated in Chapter 6, a new condition will provide for national roaming between Third Generation licensees.

7.4 The Wireless Telegraphy Act licence is expected to include standard conditions to safeguard others against undue interference. Licensees will provide the Radiocommunications Agency with information regarding the intensity of spectrum use to monitor that the spectrum is efficiently used and to assess the possible need for future spectrum requirements.

7.5 Third Generation licences will also include other standard conditions under section 7 of the Telecommunications Act such as:

- maintenance of effective competition where the licensee operates a system or provides services overseas,

- essential interfaces, which deals with compatibility of different systems,
- customer interface standards,
- numbering arrangements,
- arrangements for international connection services,
- controlled services (premium rate),
- notification of changes in shareholding,
- licensee's group, which prohibits companies in the same group from doing anything that the licensee is prohibited from doing under the licence,
- payment of fees.

7.6 It is anticipated that Third Generation licensees will, like Second Generation operators, be able to provide a wide range of telecommunications services with few exceptions. Conditional Access Services (e.g. controlled access of subscribers on the basis of payment) will not be allowed under a Third Generation licence but will remain a separate licensable activity under the Class Licence for Conditional Access Services. The Second Generation mobile licences also disallow the provision of international facilities between the UK public switched network and the equivalent of a public switched network overseas (other than a GSM/PCN system) and the Government may decide for policy/regulatory reasons to retain this restriction in the UMTS licences. The Government sees no reason to restrict the provision of broadcasting services over Third Generation networks. However, this does not in anyway affect the Government's current position of preventing PTOs from broadcasting services over their current existing network.

Code Powers

7.7 PTO status brings with it not only the obligations and conditions in the licence, but also the benefit of Code Powers. In order to allow Third Generation operators to install their systems so that they can meet their coverage obligation, the licences issued to them will grant them Telecommunications Code Powers (contained in Schedule 2 of the Telecommunications Act 1984). The Code sets out a number of rights and obligations concerning access to public and private land, including the public highway. The licences will set out exceptions and conditions to the application of the Code. Under these provisions Third Generation operators will, inter alia, be required: to give 28 days written notice to the planning authority before installing any new Telecommunications Apparatus above the ground (except in the case of protected areas such as a National Park, Site of Special Scientific Interest, National Nature Reserve, National Scenic Area, Grade 1 Listed Building, Category A Listed Building, etc., where 40 days notice will be required). There will also be a requirement that the visual amenity of properties (in particular in the Statutory List of Buildings which have been notified by the planning authority to the operator as deserving special consideration) in proximity to masts/towers must be protected as far as is practicable. In addition, all reasonable steps will have to be taken to investigate using, or replacing, an existing mast or other structure, whether a Third Generation operator's or any other operator's before erecting a new mast (where a new mast/tower is required, the Third Generation operator will be required to investigate co-operating with another operator in erecting a new mast/tower for joint use). Third Generation operators and their agents will be expected to adopt and implement the Department of the Environment's and Welsh Office's Code of Best Practice for the installation of radio masts using permitted development rights. The Government

regards discussions with local planning authorities before submitting the relevant notifications/applications as highly desirable and looks to operators to initiate such discussions. Finally, Third Generation operators will be reminded of their obligation to remove redundant apparatus under Section 22 of Schedule 2 of the Telecommunications Act 1984.

7.8 As indicated in Chapter 6 above, licences issued to Third Generation operators under section 7 of the Telecommunications Act will be subject to statutory public consultation following their success in the auction, by virtue of section 8 of the Telecommunications Act.

Convergence of Technologies

7.9 In principle, there should be no regulatory barriers to the development of convergence in telecommunications and between telecommunications and broadcasting. Technological developments and customer demand are increasingly pushing towards convergence and any unnecessary regulatory barriers would only serve to limit customer choice and inhibit the development of a competitive market in convergent services. Many of the issues raised by convergence are, however, new and require careful consideration. OFTEL is in the process of identifying, in its Fixed/Mobile Convergence Project, whether there are any regulatory barriers to the development of convergence and, if so, what can be done to eliminate them without damaging competition or consumer interests. It is also considering what regulatory measures might be needed to address potential anti-competitive behaviour. The recently-announced British Interactive Broadcasting joint venture will use satellite broadcasting and switched telephone networks. This is only one of a number of similar hybrids of broadcasting and traditional telecommunications under development. It is thought that regulation should be technology-neutral; the choice of technology or combination of technology should be determined by the market. The implications for regulation of such developments will need to be carefully considered.

Adequacy of Existing Competition Law

7.10 At the moment, OFTEL's regulatory decisions treat the mobile market as a separate one. As this consultation document has made clear, this may change over time. The level of control powers that will be needed in addition to general competition law will depend on the extent to which operators can be expected to have market power in the relevant market.

7.11 The following additional powers may be sufficient:

- reserve powers to impose price control, if the market shows signs of oligopolistic behaviour,.
- rules on interconnection or to settle the terms of interconnection,
- possibly, an absolute prohibition on undue discrimination (i.e. without the need to first show anti-competitive effect in each case) coupled with a price publication rule to ensure that the prohibition is observed,

- for unilateral behaviour (i.e. where there is no commercial agreement between independent undertakings), both Article 86 and the Fair Trading Condition prohibit abuse of dominant positions.

Interconnection with Non-UMTS Networks

7.12 Third Generation mobile network operators who are granted PTO licences will probably be entitled to be included in Annex II of the Interconnection Directive. This will give them rights and obligations to interconnect with other Annex II operators. A consultation exercise will take place in the Autumn setting out who the UK expects to be included in Annex II. The interconnection arrangements for provision of Third Generation services will probably reflect those now in existence for broadband services over the fixed networks, although the charging arrangements have obviously to be decided. Again, as far as possible, these should be left to market forces.

Free Circulation of Equipment

7.13 The European Commission is finalising the content of the Connected Terminal Equipment (CTE) Directive, which will facilitate the free circulation within the EU of approved terminal and radio equipment. The Directive should be in place by 1999, well in time for the launch of Third Generation services. As regards UMTS mobile equipment approved outside the EU, a similar approach to that being taken for global satellite service, based on Mutual Recognition Agreements between the EU and other countries or trading blocks is expected to apply. There is also likely to be a CEPT Decision covering the free circulation of UMTS mobile equipment in non-EU European states. It is expected that the CEPT will establish in a timely manner the necessary arrangements for the free circulation and use within the CEPT.

8 LONGER TERM DEVELOPMENTS

8.1 Third Generation services will develop and evolve further to offer personal multimedia communications with higher bit rates and new and innovative services. In the long term it is expected that the mobile environment will fully emulate the fixed environment, making redundant the user's selection and awareness of the communication medium. There will be a need to address the additional spectrum requirements as well as the position of the existing Second Generation systems in the long term.

Additional Spectrum for UMTS

8.2 The UMTS Forum has projected that the total requirement for Second and Third Generation mobile systems is approximately 550 MHz by the year 2010 with a market penetration of around 75% in the EU. After the year 2010 it is anticipated that the increase in market penetration will not be significant, and the demand for extra spectrum will be due to the greater use of multimedia services. GSM/PCN and DECT and the UMTS terrestrial component currently have 395 MHz of spectrum allocated. The Forum has recommended that a further 160 MHz for terrestrial UMTS use be harmonised within and beyond Europe.

8.3 It is expected that the WRC-99 will consider the additional spectrum requirement for the Third Generation systems. Europe, through CEPT, will have to support the studies leading to WRC-99 to influence the decisions on the amount, location and availability of this additional spectrum. Once the spectrum has been allocated, the CEPT will have to take necessary further action to harmonise its availability within the required time scale within Europe. However, further spectrum requirements, as always, will have to be planned carefully, giving adequate time for any migration requirements, and justified against the demands on the spectrum by other services. The position of the existing Second Generation systems will also have to be assessed at the same time.

8.4 In identifying and allocating additional spectrum, the Government may consider whether to offer additional spectrum to existing operators or to new operators. These issues will be analysed nearer the time. It would be in the interests of competition to licence as many operators as possible. However, any decisions on this will also need to take into account the spectrum required to offer a minimum and commercially viable service. It is recognised that the amount of possible future spectrum will have a significant effect on the business case of any potential bidders. Any additional spectrum would need to be identified on a European basis by the CEPT ERC. Any allocation of future spectrum for UMTS will need to comply with the Licensing Directive, which precludes the denying of spectrum for a service simply on the basis that the regulator believes that the market cannot support another operator. Thus if future spectrum were available on a harmonised basis for UMTS it would have to be allocated in a fair and transparent manner, bearing in mind the minimum spectrum required by any operator. **Views on this issue would be welcomed.**

8.5 The UMTS Forum report suggests that wireless in the local loop type services, provided by UMTS technology, may be accommodated in a non-harmonised spectrum allocation on a country by country basis. It should be noted, however, that CEPT is currently considering the issue of wireless in the local loop services and is also likely to consider the harmonisation of frequency bands within Europe. The UK is expected to play an active part in these discussions. In considering additional spectrum for UMTS it should be recognised that the spectrum below 3 GHz is a valuable and very heavily used portion of the radio spectrum, which should, as a priority, be used for high mobility type services as well as for rural wireless local loop applications. Currently Rural Radio Fixed Access in the UK is provided in frequencies below 3 GHz. The above consideration might lead to the conclusion that frequencies above 3 GHz should be used to provide urban wireless local loop applications.

Refarming of spectrum assigned to GSM and PCN services

8.6 The ongoing discussions within European fora suggest that the spectrum used by current Second Generation services, i.e. GSM/PCN at 900 MHz and 1800 MHz and DECT, would eventually be refarmed and used for Third Generation services, and that current Second Generation GSM/PCN operators should be able to refarm this spectrum to provide Third Generation services. It is also recognised that Second Generation services will continue to provide communications in many areas where Third Generation services are not provided, particularly during the rollout of Third Generation, and will also be used in providing international roaming.

8.7 Since the licensing procedure for UMTS will be fair and transparent there can be no guarantee that existing GSM/PCN operators will be successful in their application for a Third Generation licence. This might lead to a situation where existing Second Generation operators, who fail to gain a licence for Third Generation services, may wish to continue to provide Second Generation services well into the next century.

8.8 No decisions have been taken on the further licensing of Third Generation operators beyond those identified from the initial auction process. Any additional licences for Third Generation, allocation of additional UMTS spectrum or the refarming of GSM/PCN spectrum to Third Generation by operators able to offer services in both bands, would need to both comply with the Licensing Directive, and the need for fair competition in the mobile market. Questions over whether refarmed spectrum should be common for Third Generation internationally, whether additional Third Generation operators need access to the internationally harmonised spectrum, and the continuing needs of Second Generation operators in the GSM/PCN band, would need to be addressed before any decisions could be taken. These decisions would only be taken after full consultation with those affected and after a public consultation. **Views on these longer term issues would be welcome.**

Frequencies above 3 GHz

8.9 One of the planning scenarios in Chapter 4 suggests that the spectrum identified for UMTS at 2 GHz should be used for full mobility applications and that deregulated high data rate wideband applications should use spectrum above 3 GHz. It is suggested that in order to meet the requirements of the limited range and indoor environment of the Information Society of the 21st Century high capacity systems with data rates greater than 2 Mbits/s may well be required. It has been suggested that Mobile Broadband Systems, MBS, could provide complementary services to UMTS. MBS is anticipated to operate around 42.5 - 43.5 GHz & 65 - 66 GHz and provide for up to 155 Mbits/s data rate applications. It has also been suggested that the Broadband Radio Access Network project, BRAN, underway in ETSI, could also provide complementary services to UMTS. The BRAN project includes radio services such as the next generation of Hiperlan which are intended to provide for up to 25 Mbits/s data rate applications in the indoor, localised environment. The synergy between UMTS and these systems should be explored and **views would be welcomed on these issues**. The relationship between UMTS and Wireless Local Loop will also need to be considered.