Response to "Radio Spectrum Management Review: A Consultation Paper"

1. Introduction

Inmarsat is pleased to offer the following comments on the Independent Review of Radio Spectrum Management.

Inmarsat began life over 20 years ago as an intergovernmental organisation. Since 1999, it has been a UK-based private company. With its office in London, it currently has about 400 employees in the UK. Inmarsat provides a global mobile satellite service to maritime, aeronautical and land based users.

Inmarsat user terminals are capable of being used almost anywhere in the world. Maritime terminals are used to provide voice and data communications to ships. The Inmarsat network provides safety communications to ships as an integral part of the Global Maritime Distress and Safety System, developed by the IMO. Aeronautical terminals are used to provide communications to aircraft, for the purposes of air traffic management, operational communications for airlines, and communications for passengers. Land terminals are used to provide communications to users virtually anywhere in the world, particularly for those users who travel beyond the reach of terrestrial networks. Example users are journalists, military users, and globally travelling business men and women. An important application for Inmarsat terminals is in the provision of emergency communications in disaster situations such as after an earthquake or hurricane.

Inmarsat user terminals operate in L-band spectrum (transmitting in 1626.5-1660.5 MHz and receiving in 1525.0-1559.0 MHz, a total of 34 MHz in each direction). Feeder links between the satellites and the gateway earth stations operate in the C-band fixed satellite service allocations.

The 2x34 MHz spectrum is allocated globally to mobile satellite services in the Radio Regulations. The spectrum is currently shared between 10 MSS operators, together operating 22 geo-stationary satellites and providing global or regional services. The shortage of MSS spectrum continues to be a concern to MSS operators. New operations have only been possible through innovative frequency reuse methodologies; however, not all operators have access to their full required spectrum because the spectrum demand exceeds the availability. Due to the recognised shortage of MSS frequencies, UK and other administrations have proposed additional allocations for MSS at WRC-97 and WRC-2000. These proposals were not successful. Further proposals for additional allocations are again being considered for WRC-2003.

2. Comments on the issues for discussion

Economic gains from efficient use of spectrum

i. How best can Government assess the economic gains from enabling more efficient use to be made of spectrum?

In assessing the economic gain from spectrum management decisions, it is important that it is recognised that economic gains come in different forms and that some benefits from radio services are not economic in nature. Some services do not provide immediate economic benefits. For example, aviation safety services may not bring any license fees to the Government and may not bring direct revenues to operators or airlines. However, without these services, the enormous economic benefits of business travel and tourism may be in jeopardy. This is discussed further under ii).

With respect to assessments of spectrum efficiency, it should be recognised that to measure the efficiency of spectrum use is not a simple exercise. In particular, it is hard to see how a measure can be applied to compare the spectrum efficiency of different systems, due to the great differences between the kinds of benefits provided by radio services. This is fairly obvious in the case of widely different services, such as

for example communication and navigation, but is true even for systems that provide fairly similar services, such as terrestrial and satellite networks providing mobile services. Is a terrestrial system providing high capacity in densely populated areas more or less spectrum efficient than a satellite system providing full global coverage? Comparisons of spectrum efficiency between different services are therefore questionable at best and the Government should not try to base allocation decisions on such comparisons.

This is not to say that assessments of spectrum efficiency can never be done. Spectrum efficiency can sometimes be compared between systems providing the same services in the same areas and could then form the basis for decisions on for example the choice of technical standards or frequency arrangements. However, even within a single service it may be difficult to compare spectrum efficiency between systems when the conditions of use or the markets served are different. For example, a comparison between different MSS systems is complicated by the fact that some systems are global and some are regional, and a system such as Inmarsat has requirements to support GMDSS legacy terminals.

ii. How could information from market transactions and economic impact studies best help inform the design of spectrum management policies?

Any spectrum management model based on economic data has to ensure that all relevant factors are taken into account. Economic benefits are of many different kinds and can be direct or indirect, short-term or long-term. Furthermore, some benefits of radio services may not be economic, but more of a social nature. Even if such benefits can be translated into economic terms, the way that this is done is of crucial importance to the validity of the studies.

For example, the value of MSS in providing additional choice for consumers, in providing communication to users where no alternative exists, and in providing safety of life communications for maritime and aeronautical users is inevitably more difficult to quantify. Most administrations however recognise these benefits and therefore apply a light touch licensing regime to MSS. Furthermore, over recent years the UK and other administrations have actively supported the provision of additional spectrum allocations to MSS.

The Consultation Paper talks about “mismatches” between the economic value calculated for different services, the amount of spectrum allocated to these services and the licence fees. It appears that these perceived mismatches are due to an assumption that the ratios between these three different quantities should be the same for all services. However, no evidence has been given as to why this should be the case.

The economic data presented in the Consultation Paper gives an indication of the current value of radio services in the UK, but cannot predict what effect a change to the current spectrum management policies would have. For example, the data can not give any indication of whether a re-allocation of a band or a change in licence fees would affect the total economic value of spectrum use positively or negatively.

The goal of spectrum management should be to maximise the efficiency of the use of the spectrum and the benefits provided to the public (possibly measured by an appropriate economic model). However, the spectrum allocation table that achieves the greatest total economic value can not be determined based on the type of economic data presented in the Consultation Paper, even if this data took into account all the relevant factors (including long-term, short term, direct and indirect economic benefits and social benefits). For example, one might argue that a service that generates relatively high value with relatively little spectrum should be allocated more spectrum. An additional allocation to this service may indeed stimulate economic growth. However, if enough spectrum is already allocated to satisfy market demand for the service, an additional allocation may make no difference to the value the service contributes. In this latter case, the additional allocation would be detrimental to some other service that would have to give up spectrum, and the total effect on the economy would be negative.

Similarly, it is not clear why there is a perceived mismatch between licence fees and the value of different services or what the appropriate relationship between these quantities should be. It is entirely reasonable that the ratio of licence fee to economic value differs between different services. Operation of some services may generate large revenues for the operators, who may then be able to pay higher licence fees than operators of services where the benefits are more indirect or may accrue to other parties.

Considering the likely difficulties of developing a model that can capture all the diverse benefits provided by different services, and that is also able to predict the consequences of future spectrum management decisions, it is recommended that such models be treated with great caution. Studies such as the one presented in the Consultation Paper would probably best be used as part of periodic assessments of the economic impact of radio in the UK.

Economic principles of spectrum management

iii. How far can the over-arching principle, that spectrum users should bear the opportunity cost of their usage, be applied in practice?

As the Consultation Paper does not define opportunity cost, a definite answer to the question cannot be given. One understanding of the over-arching principle might be that fees should be charged at the maximum level tolerable to the licensees and that this would stimulate more efficient spectrum use. Although licence fees may have an effect on spectrum users, higher licence fees would not necessarily lead to more efficient use of the spectrum. For example, more spectrum efficient technologies may be more expensive, and a licensee may therefore choose to operate a less efficient technology and pay a higher licence fee.

The Consultation Paper states that changes in spectrum management policies should lead to higher quality, lower cost and greater variety of services. Higher licence fees would give an immediate increase in the Government's income, but may not achieve any improvement, or may even cause a change for the worse, in these overriding objectives.

High licence fees may instead hamper the development of the service and do not necessarily stimulate more efficient use of the spectrum. Fees have to be realistic for the particular services to which they apply. Even licensees providing very similar services can not realistically be expected to pay the same fees. For example, a mobile-satellite network may require a similar amount of spectrum as a terrestrial mobile network, but serves a much smaller number of customers. Furthermore, the mobile-satellite network operator has to obtain licences in every country where service is to be provided (possibly up to two hundred countries). It is therefore obvious that the mobile-satellite operator cannot pay the same licence fee and remain in business.

It must not be forgotten that other spectrum management techniques are available to stimulate efficient spectrum use, such as judicious allocations, strategic planning, encouragement of spectrum efficient technologies and due diligence procedures.

iv. How can the trade-offs between competing economic and social uses of spectrum be more clearly articulated in the principles governing spectrum management?

Most services are not either "economic" or "social", but have both economic and social elements, and these elements can often not easily be separated. Many services have both commercial and public service aspects, such as broadcasting. From the users point of view, the social benefit of providing telecommunications services to rural and remote areas is likely to translate into [long-term] economic development of the served area. Similarly, provision of other purely "social" benefits such as distress and safety communications does promote economic growth. The distinction between economic and social uses of the spectrum may therefore not be helpful.

However, it has to be recognised that some services have greater economic resources than others, and spectrum managers have to consider the risk that these services could squeeze out more public service oriented services. If economic models are used to make allocation decisions, these models would therefore have to accurately factor in social benefits, as well as indirect and long-term economic benefits. As mentioned above, there is some doubt as to whether this will be feasible.

Legislative basis for spectrum management

v. To what extent would a separate spectrum management duty for Ofcom be helpful, and how could this best be articulated in a new statutory framework for communications regulation?

The most efficient use of the radio spectrum is achieved if one regulatory body is responsible for the allocation of spectrum for all radio services across the entire radio spectrum. Only in this situation can the needs of the different services be objectively assessed. More detailed planning and licensing could be carried out by separate bodies where appropriate.

vi. What additional statutory alternatives to apparatus licensing could assist Ofcom in meeting its spectrum management objectives?

Four types of licenses are considered to be relevant for mobile-satellite systems:
1. Space segment licenses
2. Satellite Control Centre (SCC) licenses
3. Feeder link Earth station licenses
4. User terminal licenses

A space segment license from the BNSC may be required for UK companies to launch and operate a satellite; an SCC facility is required to be located on UK territory and requires a license to operate; a feeder link earth station license would be required for operating a feeder link station in the UK; and a user license may be required for certain types of satellite user terminals, unless these are exempted through appropriate legislation.

All these types of licenses are understood to fall in the category of "apparatus licenses". As discussed in the answer to the next question, spectrum access licences would not be suitable for MSS.

vii. How far can new modes of licensing, based upon access to defined spectrum rather than defined wireless apparatus, assist in enabling more efficient use to be made of spectrum?

Inmarsat land terminals are licence exempt for use in the bands 1525.0-1559.0 MHz (receive) and 1626.5-1660.5 MHz (transmit). Exemption is on the basis that Inmarsat terminals meet certain equipment standards which ensure adequate protection from interference to other users in the same and adjacent frequency bands. Similar provisions apply to terminals of other MSS systems which operate in the same and other bands. These provisions, and other licence exempt spectrum use, avoid the unnecessary bureaucracy of individual licenses for large numbers of terminals.

Such licence exemption provisions are similar to the spectrum access regulations discussed in the Consultation Paper in that they apply the minimum restrictions possible while ensuring other users are adequately protected. However, these provisions may not be the same as spectrum access rights for the reasons given below.

The purpose of spectrum access licensing is said to be to move towards a more technology-neutral approach to spectrum management. This would presumably allow licensees to sell their licences, or regulators to re-assign a licence, to another licensee who might provide an entirely different service (as long as this service complies with specified boundary conditions).

There are important limitations on how far technological neutrality can be taken. Different services could not operate under the same boundary conditions. Boundary conditions have to be determined based on the specific services that operate in adjacent bands or areas. For example, even if it has been determined that a terrestrial mobile service can operate in an adjacent band to a terrestrial fixed service based on certain boundary conditions (e.g. unwanted emission limits and/or guard bands), a satellite system operating in the mobile service spectrum may still suffer unacceptable interference.

One argument against spectrum access licences for satellite services is that in satellite bands national regulators do not have direct control of the spectrum. Although licenses are awarded by the UK for UK MSS networks, assignments of frequencies are agreed through international frequency coordination, where also non-UK networks are involved. Also operational parameters are limited to those agreed in frequency coordination.

It is suggested in the Consultation Paper that spectrum access licensing would enable regulation of signals from satellites. Although the WT act does not require licensing of receivers, Inmarsat and other MSS receivers are in effect already licensed though the exemption provided to the terminals. Hence, there does not appear to be anything to be gained from the perspective of spectrum efficiency from spectrum access licensing for satellite emissions.

Regulatory framework for spectrum management

International dimension

viii. How can the UK's stance towards international spectrum management policy best reflect the opportunity costs of different spectrum uses?

No comment until it is clear how different opportunity costs are established.

ix. What scope is there for greater autonomy in domestic spectrum policy within the constraints imposed by the UK's international commitments?

The Inmarsat system, like many satellite systems, provides a global service. It is therefore necessary that international allocations to satellite are also global and that national allocations conform to the ITU allocations. Where national frequency use is contrary to international satellite allocations, the ability to use satellite terminals in that country would be lost. A national allocation to satellite which is not in conformity with international allocations will almost certainly be unused since the cost of providing satellite services generally precludes systems limited to coverage of one or a few countries.

The potential for interference across national borders also has to be taken into account when considering nationally differing allocations. Such issues are particularly relevant for satellite services, since satellite transmitters illuminate large parts of the Earth and satellite receivers can receive interference from similarly large areas.

x. How should the UK Government judge the trade-off between a more liberal approach to spectrum management and one in which technology standards and spectrum access are mandated as part of a strategic industrial and trade policy?

The approach has to be based on the specific services involved. For some types of services, like low power devices, international harmonisation of spectrum allocations is not required for any technical reasons, but may be beneficial for manufacturers and might enable free movement of terminals across borders. For other services, in particular satellite communications, global harmonisation of frequency allocations is crucial, but mandatory harmonised technical standards are not required.

It should be noted that the need for international harmonisation of frequency allocations for some services will have a knock-on effect on other services, since unregulated services would have to be put in bands that are not internationally harmonised. Conversely, widely diverging national allocations for some services will inevitably make it difficult to find suitable harmonised bands for services that need them. For these reasons, harmonisation of bands even for services that would not really need internationally harmonised bands may often be advantageous.

xi. If there were greater latitude in international allocations and/or the UK's implementation of such decisions, to what extent would market mechanisms result in harmonisation of equipment and transmission standards?

With regard to satellite services, greater latitude in international allocations (i.e. less global harmonisation) would be detrimental for reasons not related to the harmonisation of equipment (as discussed above). Less harmonisation of allocations for other services is likely to result in less harmonisation of equipment standards. For services where such harmonisation is desirable, e.g. mobile telephony, global harmonisation of allocations is therefore desirable.

National dimension

xii. Within the current and proposed statutory framework, what improvements (if any) could be made to the institutional arrangements for spectrum management in the UK?

As mentioned above, the most efficient spectrum management would result with a single objective body responsible for allocation decisions.

xiii. To what extent would greater transparency of specific data on current and prospective spectrum uses support efficient spectrum use? What are the key issues and trade-offs pertinent to the provision, by RA, of an on-line database containing spectrum-utilisation details? How far is transparency compatible with commercial confidentiality and public safety and security considerations?

Data on different services and systems is generally made available by users and manufacturers when there is a need for studies on particular frequency bands. Where spectrum is not used by other services, there is no apparent benefit in provision of an on-line database with respect to spectrum utilisation. Certain types of data may be commercially sensitive.

xiv. To what extent could intermediaries play a valuable role in buying rights to manage a particular frequency band and then selling access to parts of this spectrum to users on a commercial basis?

This kind of arrangement would appear to offer benefit only for services that are subject to spectrum trading.

Spectrum use: marketed and non-marketed outputs

xv. To what extent is the review's distinction between radio spectrum used for marketed and non-marketed goods a helpful one?

As discussed under iv), the distinction between "economic" and "social" uses of the spectrum is not very helpful. Similarly, a distinction between marketed and non-marketed goods may be artificial, as there are services or technologies which may provide both marketed and non-marketed goods.

xvi. How far can public policy objectives for the delivery of non-marketed goods be separated from the regulation of access to the spectrum necessary to deliver such services?

The Government must ensure that enough spectrum is available to deliver the services.

Spectrum pricing and auctions

xvii. How far have economic incentives from spectrum prices helped to encourage efficient spectrum use?

Most services suffer from a shortage of spectrum to some extent or another. Hence, to ensure that services can grow, operators use spectrum more efficiently by investing in spectrally efficient technology. Examples are the introduction of new efficient modulation techniques, cellular mobile operators introducing more, smaller cells, and MSS operators introducing satellites with multiple spot beams. The economic incentives for such development are driven by the business requirements to provide a certain level of service within a limited frequency band to a much larger extent than the economic incentives provided by spectrum pricing.

The current congestion is already ensuring that MSS operators invest large sums of money to improve the efficiency with which the available spectrum is used. As an example, Inmarsat is in the process of launching two state-of-the-art satellites, employing spot beams which allow an increase in frequency re-use. Hence the current frequency sharing process already ensures spectrum is used as efficiently as economically feasible.

xviii. Where should the balance lie between administratively-set incentive prices and competitive auction of spectrum licences? To what extent could the two approaches be combined to encourage spectrum efficiency?

We are not aware of any evidence that auctions encourage more efficient use of spectrum or greater economic development. Although the Government may gain very directly from auctions, it has become apparent that the recent auctions have caused great economic difficulties for mobile phone companies and may not be of economic benefit for the economy as a whole in the longer term. The law of diminishing returns also dictates that auctions of further spectrum for the same services would bring less income to the Government and the efficiency of spectrum use will be reduced as the amount of spectrum assigned to a certain service becomes greater than market demand.

xix. What factors should determine the choice of frequencies subject to auction of licences?

Auctions should only be considered in situations where there is an excess demand over supply and no other method is available to resolve the situation. This is not the case in satellite bands, since the UK Administration is able to file requests for coordination to the ITU for any UK satellite operator that wishes to launch a satellite.

In satellite bands, national Administrations do not have the ability to offer for auction clearly defined licences with specified frequency bands and technical conditions. Frequency assignment to satellite systems are agreed through international frequency coordination, and coordination often results in operators' having to accept compromises, constraints or even changes in fundamental parameters, such as orbital location. This generally results in a coordinated network filing being usable only for one operator.

In fact, the ITU procedures are based on the premise that satellite filings are made on behalf of specific operators and these filings are therefore generally not of use to other operators. Some Administrations do make filings without specific requests from operators, in an attempt to reserve valuable orbital slots for their national use. However, this is a practice that contributes to the ITU satellite filing backlog, and the ITU has adopted due diligence procedures to try to discourage this. The UK (and some other Administrations) has their own national due diligence procedures that ensure that any filings made are for real satellite networks.

Finally, satellite operators must win approval from not just one, but many administrations. Imposition of auction requirements by one or more administrations would have the effect of requiring a system operator (assuming it can successfully win each auction) to pay for using the same spectrum over and over again all around the globe. At best, if an operator succeeded in piecing together a global system, service prices would be driven prohibitively high. What is more likely, however, is that global deployment would be impossible. Spectrum auctions for satellite services thus would threaten the survival and viability of satellite systems.

Spectrum trading

xx. Which areas of spectrum use are most amenable to and which areas offer the greatest potential efficiency gains from the introduction of spectrum trading?

Spectrum trading should only be considered in bands where there is a large enough market, i.e. a sufficient number of available licences and a large number of potential buyers, to ensure that no single player can dominate the market and dictate prices.

The number of MSS players is too small to create a market for licenses. Only a few countries in the world operate or plan to operate MSS systems at all. Even though the UK is a world leader in MSS, in any given frequency band there may be only one or two UK systems in operation in the future (and in some bands there may be none).

Further, the spectrum assigned to each operator is determined by technical sharing conditions between systems. Hence a particular frequency assignment has value only to the MSS operator for which the assignment is aligned with the sharing agreement and is unusable to other operators.

Another concern with spectrum trading for satellite services is that it would exacerbate the already significant problem of paper satellites and the filing backlog and thereby contribute to inefficient use of the

spectrum. When a satellite operator terminates operations or cancels plans for operations, the coordinated spectrum becomes available for other operator through the frequency coordination process. However, if operators had the ability to sell off their coordinated slots, they might hold on to their assignments in the hope of finding a buyer. This possibility is also likely to lead to operators attempting to coordinate orbital slots with the only intention to sell them on.

With regard to possible trading with an associated change of service, this would undermine satellite allocations, where, as discussed in ix), globally harmonised bands are essential. If an Administration were to allow other services on a national basis to use satellite spectrum, such harmonisation would become impossible and the viability of satellite services would be jeopardised.

xxi. To what extent would a move to licensing of spectrum access, as opposed to wireless apparatus licensing as now, facilitate spectrum trading?

No comment.

xxii. What changes to the terms and conditions of licences for the operation of wireless equipment and/or for access to spectrum would facilitate spectrum trading?

No comment.

xxiii. If new modes of licensing spectrum access (rather than equipment operation) were introduced, how could rights to spectrum usage, such as interference standards and length of licences, best be defined to facilitate spectrum trading?

No comment.

xxiv. What market infrastructure, such as spectrum registers and dispute resolution procedures, could facilitate spectrum trading?

No comment.

xxv. What lessons can be learnt from the experiences of other countries (such as Australia, New Zealand and the United States) in introducing different modes of spectrum trading?

No comment.

The boundaries of spectrum regulation

xxvi. What factors should guide regulators in setting the boundaries of licence-exempt spectrum use?

xxvii. What remit should regulators hold over licence-exempt spectrum use, other ensuring that it does not interfere unduly with licensed spectrum use?

xxviii. How far can developments in radio technology provide an alternative to regulation in licence-exempt spectrum bands, particularly where the potential for interference with other users is very low given the propagation and power characteristics of the signals concerned?

In the UK (as in most countries) MSS terminals have been given licence exemption. A general licence such as that provided by licence exemption is the only practical means to licence MSS terminals and is prescribed by various ERC Decisions and by the EU Licensing Directive.