

FEI Response to the Independent Review of Radio Spectrum Management Consultation Paper



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The Federation of the Electronics Industry (FEI), as the UK's leading trade association for the IT, telecommunications, radio and electronics industries welcomes the Independent Review of Radio Spectrum Management announced by the Government. This highlights the need for a balanced response to the important issues surrounding the need to give **all** radio spectrum users an incentive to use that spectrum with the greatest efficiency. Affordable access to the spectrum in a timely manner is essential for many FEI members to meet their goals.

FEI agrees with the Review's premise that maximising economic efficiency in spectrum use across all sectors of the UK economy does not equate to a focus on maximising proceeds to the Exchequer from ongoing spectrum useage fees or one-off auction proceeds. We also welcome the review's starting point that 'charges on spectrum use should be applied where necessary to guide spectrum to its most efficient uses. Charging is not an end in itself.' Utilisation of the spectrum should be as high as possible, while prices are kept low.

FEI emphasises the following key points, which we wish to draw to the attention of the Review Team.

- **FEI agrees that a more efficient use of the radio spectrum can best be achieved by developing a regime for spectrum management that gives *all* spectrum users an incentive to take into account the value of the spectrum they are using. FEI does not support the concept of opportunity costs as the main economic factor in determining appropriate fees.**
- **The public sector (including broadcasters, emergency services, and defence users) should be treated in the same manner as the private sector.**
- **FEI does not agree that the spectrum can be managed by an approach that is completely "technology neutral" (as described in paragraph 30 of consultation paper).**
- **FEI recommends that the framework for national spectrum management, and the interface to international spectrum management, be based on a significantly extended UK spectrum strategy that sets out the planned and published evolution of the entire UK spectrum against a structured timeframe.**

- **FEI believe that UK-specific solutions on spectrum use would be of limited value. The economic benefits of European/Global markets far outweigh national considerations, and we see little scope for greater autonomy.**

We offer the following overall comments.

1. **Spectrum Pricing**

FEI agrees that a more efficient use of the radio spectrum can best be achieved by developing a regime for spectrum management that gives *all* spectrum users an incentive to take into account the value of the spectrum they are using. As a general principle, FEI supports the original application of spectrum pricing for spectrum management purposes (as laid down in the Wireless Telegraphy Act 1998). A move to pricing based routinely on estimated opportunity costs would be a major risk, the case for which seems difficult to make. Licence fees are effectively a tax on industry and risk impeding investment in technology and take up of new services if the levels are excessive. Given the importance of communications to the UK, much higher charges would jeopardise social benefits and improvements in the overall efficiency of UK industry.

Therefore FEI does not support the concept of opportunity costs as the main economic factor in determining appropriate fees. It is, however, necessary to have a common understanding of this term in the context of the consultation paper. Many other important factors are also relevant, for example social and industrial efficiency benefits and these may point towards much lower fees or even license exempt use such as DECT cordless telephones.

Industry would also appreciate, from the deliberations of the Review, an indication as to how spectrum allocation might be expected to change under a new regime by the presentation of different scenarios for discussion prior to the publication of the final report.

FEI welcomes the review's focus on maximising economic efficiency in spectrum use across all sectors of the UK economy and that the review's starting point is that charges on spectrum use should be applied where necessary to guide spectrum to its most efficient uses. Charging is not an end in itself. Utilisation of the spectrum should be as high as possible, while prices are kept low.

FEI is of the opinion that the greater part of the benefit of the spectrum to the Gross Domestic Product (GDP) lies in the use of the spectrum rather than in its initial pricing. Whilst pricing has a clear role in promoting improved spectrum efficiency, in some circumstances it can have an adverse impact on the broader social and economic benefits. We particularly have in mind the example of the use of spectrum to facilitate "Broadband Britain" or "Internet for All" services outside the more densely populated areas. **FEI considers that high fees paid at auction reduce licensees ability to fund the subsequent roll out of networks and applications.**

2. **Equal Treatment**

The public sector (including broadcasters, emergency services, and defence users) should be treated in the same manner as the private sector. Non-commercial users of radio spectrum should be given the same incentives to allocate services and upgrade to more spectrally efficient systems as commercial users. The key question is how the UK should balance the needs of the different sectors and still provide a real incentive to use spectrum as efficiently as possible.

3. Technical Restrictions

FEI does not agree that the spectrum can be managed by an approach that is completely “technology neutral” (as described in paragraph 30 of consultation paper). The application for which radio is being employed to deliver services generally dictates the system chosen. In fact, we see in the industry a preferred choice of frequency bands for an application due to sound engineering reasons including propagation conditions, the interference environment, equipment costs as well as end-user quality objectives. For example, the nature of satellite communications, that spans earth stations ranging from country gateways handling thousands of simultaneous voice and data calls to handheld units providing personal communications, demonstrates the difficulties in assuming technological neutrality.

FEI believes that the spectrum must be managed under certain technical assumptions of apparatus performance to ensure the greatest number of users can be accommodated appropriate to the service without removing the user’s ability to choose better equipment

4. National Spectrum Strategy

FEI recommends that the framework for national spectrum management, and the interface to international spectrum management, be based on a significantly extended UK spectrum strategy that sets out the planned and published evolution of the entire UK spectrum against a structured timeframe. The strategy could, for instance, maintain a view of the spectrum at various points in the future to allow the inter-relationships between events and the areas of uncertainty and risk to be visible (to the greatest extent possible). This would help spectrum users who are being asked to invest significant money to make informed decisions in relation to their spectrum. This approach would address weaknesses in the present regime that result from a piecemeal approach to spectrum changes.

Flexibility will also be achieved by regular review of the spectrum strategy with industry involvement. FEI advocates the concept of “evidence based” spectrum management in which the assessment of current spectrum use, “future mapping” of the economic and technology trends and full, open and transparent consultation play essential roles.

The Radiocommunications Agency’s research agenda should be based on the spectrum strategy.

5. International Agreements

FEI believes that international agreements on spectrum use significantly benefit the UK. Indeed, the ITU and CEPT frameworks create opportunities for mass markets, to the economic advantage of all players. A narrow focus by the Review on opportunity costs in the UK would detract from the wider considerations of the European and Global markets. **FEI believes that UK-specific solutions on spectrum use would be of limited value. The economic benefits of European/Global markets far outweigh national considerations, and we see little scope for greater autonomy.**

It is generally recognised that the international agreements can take a significant time to put in place, and some streamlining of the processes might be advantageous for the future.

6. **Spectrum Trading**

By developing a more open spectrum market, for example through encouraging secondary trading in appropriate sectors, spectrum usage can be increased and spectrum availability enhanced. We look forward to the Radiocommunications Agency's consultation on spectrum trading.

Spectrum trading should be introduced in such a way that buying and hoarding of spectrum for re-sale is discouraged and any restrictions on services are maintained on transfer so that the terminal market is continued. Spectrum trading should be subject to interference safeguards and international allocation policies. It is difficult to see how spectrum trading involving change of use can be successful in some cases, e.g. satellite communications.

Spectrum will be deployed in the most effective way by encouraging users to develop or deploy new, more spectrally efficient technologies.

7. **Balance between marketed and non-marketed services**

The opportunity cost and economic value concepts are rather narrow financial based measures on which to determine the total value of a piece of spectrum to the society as a whole. **Achieving greater economic efficiency in spectrum use has to be balanced against the need to deliver other public policy outcomes that may have wider social, economic and political significance.** This is particularly the case for educational, social or cultural services that may offer considerable indirect benefits that are not easily measured in financial terms, but offer tangible economic benefits to the whole economy in the longer term.

Spectrum pricing determined solely on the basis of the opportunity cost maximises the revenue rather than the direct benefits accrued by the producers and consumers of the radio industry (*ref. paragraphs 16 & 17 of the consultation paper*). This definition does not address the indirect social, economic and cultural benefits derived by a modern knowledge economy that depends on reliable, efficient and affordable information and communications networks.

A national policy objective such as developing a broadband network for some public services and schools may be more cost effectively achieved by the use of wireless technologies in some rural and sub-urban areas, than by the alternative wired technologies. Such special cases may mandate the reservation and protection of appropriate segments of spectrum for such non-commercial services.

8. **International Benchmarking**

FEI considers that the Review should include a comparative assessment of the methods that have been used for spectrum assignment both in the UK and globally to gauge both the benefits and difficulties that may have arisen. The disadvantages of the "beauty contest" have been previously well explored and there is an increasing acceptance (or resignation) to the notion that spectrum auctions are here to stay. The design of the auction though, is expected to be a key factor in its success or failure. A number of designs have been employed with more or less success. However, it needs to be recognised that there can and will be different criteria by which success may be judged: these have not always been declared before the event and may not be immediately apparent.

A greater level of freedom has left the United States in a difficult position in respect of finding appropriate spectrum to ensure that the benefits of 3G mobile can be enjoyed in the United States as they are to be elsewhere. The recent NextWave Telecom case in the United States illustrates the dangers of assigning spectrum for short-term budgetary reasons rather than for overall economic benefit. **Every opportunity should be taken to assess the methods employed in previous bidding processes and to inject the learning into future decisions concerning spectrum allocation.**

However, the key lesson to be learned, which has come from experience so far, is the need to have analysed *all* the probable/identifiable outcomes from a particular allocation given the market circumstances. We look forward to reviewing the soon to be published National Audit Office report in this light.

There is also a need to ensure that a co-ordinated and coherent view is taken across all regulators and government so that the impact of spectrum allocation and assignment is fully considered when other regulatory decisions are taken.

9. Interpretation of Data

FEI notes that the review has drawn upon certain economic data provided by the Radiocommunications Agency for the various radio services in terms of calculated value (benefit), current license fees and amount of spectrum available. Some doubts have been raised over how some of the figures in the original Economic Impact of Radio report were derived. The FEI welcomes the approach of using data based on the total economic value. A certain emphasis is given to analysis of the calculated ratios of Benefits to Fees for the various services, but it is unclear as to how this data should be interpreted and how it should be used.

10. Economic Benefit of Standards

There is a clear need to find a balance between an entirely laissez faire approach of not linking the use of particular bands to equipment meeting certain standards, such as that which characterises the US approach to mobile telephony, and an entirely dirigiste approach which tends to stifle innovation and can lead to major mistakes. According to work carried out by NERA some years ago, the lack of common standards and interoperability in the US national cellular telephony market led to a cumulative loss to US GDP of more than \$70Bn over 15 years.

In Europe there have been major successes in the wireless world such as GSM, DVB, UMTS, etc. and these are generally considered to have outweighed the economic cost of failures (such as the Pan-European paging standard ERMES). This approach has enabled pan-European and Global markets allowing manufacturers, operators, and users to benefit from competitive sources of equipment. Customers benefit through economies of scale and shared research and development with consistent spectrum policies based on standards. Where an international standard is adopted, the Radiocommunications Agency should enable these standards to be used quickly in the UK. **The approach of linking spectrum and standards is considered by FEI to far outweigh the other options, although other mechanisms through which innovative commercial industry standards can more readily be transformed into 'open' international standards should always be explored.**

11. Auctions

Considerations should be given in designing auctions to payment mechanisms and to alternative non-financial parameters such as 'speed of coverage' and 'quality of service'. The incentive is thus to develop revenue generating service as quickly as possible. Objective measures would be determined in advance and failure to meet the bid commitments could invoke financial penalties.

12. Transparency & Consistency

FEI notes that the Review has identified the need for greater transparency of specific data on current and prospective spectrum use. The provision of information to all spectrum users about current and prospective use will offset, to some extent, the factors that militate against a more devolved approach to spectrum management. **FEI see a need for a much clearer view of current use and future spectrum supply and pricing than is currently available** (i.e. in the Radiocommunications Agency's Spectrum Strategy report). This will ensure that business decisions are based on a more solid base of information than the present and introduce a more stable basis for the development of new technologies.

The UK must strive for consistency of licensing procedures across the Community and beyond to ensure that UK companies are not disadvantaged when competing in international markets.

FEI supports the continued need for the review of spectrum management in the UK. The spectrum is a vital resource for many of FEI's members and they need affordable access to spectrum with the certainty of operational longevity. The FEI looks forward to working with the Review team as they address all of the key issues in an open manner. FEI looks forward to seeing the consolidated views of industry, regulators, users and academics brought together in the draft Report and presented for further public debate.

ANNEXE A

DETAILED COMMENTS ON THE ISSUES IDENTIFIED BY THE REVIEW TEAM

FEI offers the following comments on the issues for discussion identified by the Review team in the Independent Review of Radio Spectrum Management consultation paper.

Issue	FEI Comments
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?	(i) Regular economic and competition impact studies should be conducted with full industrial consultation and with benchmarking against other countries. FEI would be pleased to propose terms of reference for surveys.
ii. How could information from market transactions and economic impact studies best help inform the design of spectrum management policies?	<p>(i) Economic impact studies undertaken so far concentrate on the financial gains to producers and consumers and not the total economy, i.e. they have excluded social benefits.</p> <p>(ii) FEI notes that the review has drawn upon certain economic data provided by the Radiocommunications Agency for the various radio services in terms of calculated value (benefit), current license fees and amount of spectrum available. Some doubts have been raised over how some of the figures in the original Economic Impact of Radio report were derived. The FEI welcomes the approach of using data based on the total economic value. A certain emphasis is given to analysis of the calculated ratios of Benefits to Fees for the various services, but it is unclear as to how this data should be interpreted and how it should be used.</p> <p>(ii) Future spectrum management policies cannot ignore the impact of real propagation constraints and costs associated with equipment enhancements.</p> <p>(ii) There may be some conflict between achieving economic efficiency and that of ensuring a truly competitive environment.</p>
Economic principles of spectrum management	
iii. How far can the overarching principle, that spectrum users should bear the opportunity cost of their usage, be applied in practice?	(iii) FEI welcomes the review's focus on maximising economic efficiency in spectrum use across all sectors of the UK economy and that the review's starting point is that charges on spectrum use should be applied where necessary to guide spectrum to its most efficient uses.
iv. How can the trade-offs between competing economic and social uses of spectrum be more clearly	(iii) FEI does not support the concept of opportunity costs as the main economic factor in determining appropriate fees. Spectrum pricing determined on the basis of the opportunity cost is a very narrow measure of economic value. It does not address the indirect social, economic, educational and cultural benefits derived by the modern information

<p>articulated in the principles governing spectrum management?</p>	<p>society with a knowledge economy that depends on reliable, efficient and affordable communications networks.</p> <p>(iv) There is a close dependency on social benefits of wireless technologies and prohibitive access to the spectrum through aggressive competition for spectrum. Consider community radio, hospital communications and emergency services for example. These are special cases that will require considerable protection, although an independent periodic review process should be put in place to ensure that adequate use is being made of the spectrum through the use of appropriate technological solutions available at that date (e.g. a 3-year review period). Achieving greater economic efficiency has to be balanced against the needs of delivering other public policy outcomes that may have wider economic and political significance.</p> <p>(iv) While acknowledging that spectrum pricing has a role in influencing behaviour where spectrally efficient alternatives are available, FEI would challenge the view expressed in the consultation document that charging the opportunity cost (via pricing or auctions) will maximize spectral efficiency. Leaving aside for now the important issue of social (non-monetary) benefits, the main aim should be to maximise total economic benefits to the UK. As stated in the consultation document this comprises the sum of producer surplus and consumer surplus. The spectrum price that maximises producer surplus will be higher than that which maximises consumer surplus, and therefore total economic benefits. Auctions maximise producer surplus. Opportunity cost pricing (e.g. for fixed links and Private Mobile Radio) will tend to maximise revenue for the Treasury.</p> <p>(iv) Industry would also appreciate, from the deliberations of the Review, an indication as to how spectrum allocation might be expected to change under a new regime by the presentation of different scenarios for discussion prior to the publication of the final report.</p>
<p>Legislative basis for spectrum management</p>	
<p>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?</p> <p>vi. What additional statutory alternatives to apparatus licensing could assist OFCOM in meeting its spectrum management</p>	<p>(v) OFCOM will be established at a time of convergence between media and communications technologies. This process will need to be carefully managed and introduced step-by-step over a period of time. Since different parts of the spectrum are ideally suited to particular applications, strategic planning is needed to secure the future availability of spectrum matched to specific uses.</p> <p>(v) FEI is convinced that a single body should manage the spectrum for all users, including broadcasters, emergency services, and defence users.</p> <p>(v) The intricate balance of application and regulation for radio spectrum (a national and international resource) makes an independent regulatory body appropriate such that international and social aspects of the usage</p>

<p>vii. objectives? 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?</p>	<p>of this scarce resource are considered for applications other than for telecommunications (e.g. radio astronomy, amateur service, scientific and industrial use, etc.).</p> <p>(vii) The need for apparatus to achieve certain minimum standards of operation is of paramount importance in limiting interference with improved spectrum efficiency, hence enabling effective sharing by users operating within the same sub-bands and between different services in adjacent bands.</p>
<p>Regulatory framework for spectrum management International dimension</p>	
<p>viii. How can the UK's stance towards international spectrum management policy best reflect the opportunity costs of different spectrum uses? ix. What scope is there for greater autonomy in domestic spectrum policy within the constraints imposed by the UK's international commitments? 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? 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? National dimension xii. Within the current and proposed statutory framework, what improvements (if any) could be made to the institutional</p>	<p>(viii & ix) FEI believes that international agreements on spectrum use significantly benefit the UK. Indeed, the ITU and CEPT frameworks create opportunities for mass markets, to the economic advantage of all players. A narrow focus by the Review on opportunity costs in the UK would detract from the wider considerations of the European and Global markets. FEI believes that UK-specific solutions on spectrum use would be of limited value.</p> <p>(viii & ix) It is generally recognised that the international agreements can take a significant time to put in place, and some streamlining of the processes might be advantageous for the future.</p> <p>(x) There is a classic dilemma between a proactive national market-driven policy and that of an international allocation policy. A market-driven policy may encourage better practise, whilst an international allocation policy is essential for managing the interdependence of users sharing a common unbounded resource like the spectrum. Influence and constructive engagement should be the main instruments, to maintain a harmonised international approach.</p> <p>(x) Greater autonomy results in greater global isolation, yielding a fragmented market that does not achieve sufficient critical mass for long-term sustainability in any major application area. Consider the large differential between mobile use in the US (technology not prescribed) versus a substantial part of the rest of world (GSM). National autonomy should be limited to national assignments within segments of spectrum that have been allocated in accordance with international principles.</p> <p>(xi) The UK decision to promote 28GHz as the band for Fixed Wireless Access (FWA) as opposed to the majority of Europe's use of 26GHz has restricted the equipment range available for UK use.</p> <p>(xi) The Treaty of Rome must also be remembered and applied when considering any national deviation from internationally agreed spectrum allocations and standards.</p>

<p>arrangements for spectrum management in the UK?</p> <p>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?</p>	<p>(xi) There is clearly a strong link between the critical economic viability of wireless communications and the cost of the associated technology. Technology costs can be driven down through economies of scale, readily achieved in a standardised and harmonised market. The government should seek to promote the use of standards-based solutions to ensure maximum probability of success through shared technological development and a consistent strategic approach to the use of the scarce resource.</p> <p>(xi) Maintaining international standards are critical to the communications industry as they offer significant benefits to end-users in terms of lower costs and open multi-vendor competition. A harmonised standards-based approach offers significant benefits to manufacturers in an international market.</p> <p>(xi) Market mechanisms that compel equipment vendors to develop higher cost apparatus solely to comply with local market forces may result in products that are uncompetitive in the global market, even if such products offer some measure of spectrum efficiency in the short term.</p>
<p>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?</p>	<p>(xi) There is a clear need to find a balance between an entirely laissez faire approach of not linking the use of particular bands to equipment meeting certain standards, such as that which characterises the US approach to mobile telephony, and an entirely dirigiste approach which tends to stifle innovation and can lead to major mistakes. According to work carried out by NERA some years ago, the lack of common standards and interoperability in the US national cellular telephony market lead to a cumulative loss to US GDP of more than \$70Bn over 15 years.</p> <p>(xi) Where an international standard is adopted, the Radiocommunications Agency should enable these standards to be used quickly in the UK. The approach of linking spectrum and standards is considered by FEI to far outweigh the other options, although other mechanisms through which innovative commercial industry standards can more readily be transformed into 'open' international standards should always be explored.</p> <p>(xi) Regulatory structures for managing the spectrum should involve consultation with other sectors of the community who may also derive significant benefits from gaining access to the spectrum due to the availability of affordable wireless technologies.</p> <p>(xii & xiii) Greater access to statistical information will enable equipment vendors to target resources at demand 'hot- spots' and open up the potential for applications to be created where excess capacity exists with spectrum users as part of more creative technological solutions.</p> <p>(xii & xiii) FEI notes that the Review has identified the need for greater transparency of specific data on current and prospective spectrum use.</p>

	<p>The provision of information to all spectrum users about current and prospective use will offset, to some extent, the factors that militate against a more devolved approach to spectrum management. FEI see a need for a much clearer view of current use and future spectrum supply and pricing than is currently available (i.e. in the Radiocommunications Agency's Spectrum Strategy report).</p> <p>(xiv) Spectrum trading regulatory conditions must be open and transparent.</p>
<p>Spectrum use: marketed and non-marketed outputs</p>	
<p>xv. To what extent is the review's distinction between radio spectrum used for marketed and non-marketed goods a helpful one?</p> <p>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?</p>	<p>(xv) The opportunity cost and economic value concepts described in the consultation paper are rather narrow financial based measures on which to determine the total value of a piece of spectrum to the society as a whole.</p> <p>(xvi) Achieving greater economic efficiency in spectrum use has to be balanced against the need to deliver other public policy outcomes that may have wider social, economic and political significance. This is particularly the case for educational, social or cultural services that may offer considerable indirect benefits that are not easily measured in financial terms, but offer tangible economic benefits to the whole economy in the longer term.</p> <p>(xvi) Spectrum pricing determined solely on the basis of the opportunity cost maximises the revenue rather than the direct benefits accrued by the producers and consumers of the radio industry (<i>paragraphs 16 & 17 of the consultation paper</i>). This definition does not address the indirect social, economic and cultural benefits derived by a modern knowledge economy that depends on reliable, efficient and affordable information and communications networks.</p> <p>(xvi) The public sector (including broadcasters, emergency services, and defence users) should be treated in the same manner as the private sector. Non-commercial users of radio spectrum should be given the same incentives to allocate services and upgrade to more spectrally efficient systems as commercial users.</p> <p>(xvi) Regulation of spectrum will be necessary to ensure that adequate spectrum is reserved for public service use. Effective delivery of some of these services requires the use of specific segments of the spectrum with channel characteristics matched to the type of service to be delivered.</p> <p>(xvi) The category of unlicensed products has been omitted from this discussion (e.g. PMR446, Bluetooth, WLAN, cordless phones, etc). They all have a consumer surplus and therefore add to the UK economy even though the spectrum is not marketed. The table in paragraph 16 of the consultation paper includes Short Range Devices (SRD's) in 'Others' but the Economic Impact of Radio study produced by the</p>

	<p>Radiocommunications Agency (page 29) shows that consumer surplus has not been measured for SRD's. Although small in comparison with other radio sectors, the omission could lead to pressure to charge for SRD spectrum in future, and thereby reduce the total economic value (since demand will decrease).</p>
<p>Issues in non-marketed uses of spectrum</p>	
<p>Defence</p> <p>xvii. Is this a valid description of the factors affecting defence use of radio spectrum?</p> <p>xviii. What opportunities exist for commercial and other civil users to share spectrum with the defence establishment in the UK?</p> <p>xix. What further incentives could be introduced to encourage more intensive and efficient use of spectrum allocated to defence?</p> <p>Broadcasting</p> <p>xx. Is this a valid description of the factors affecting use of radio spectrum by the broadcasting sector?</p> <p>xxi. How can the Government's commitment to value the spectrum used by broadcasters be implemented in a way that encourages spectrum efficiency?</p> <p>xxii. What further incentives might be introduced, consistent with wider broadcasting policy and with previous Government commitments about television and radio franchise fees, to encourage greater spectrum efficiency by commercial broadcasters? Are there differences in the approach to incentives before and after the proposed switchover from analogue to digital terrestrial TV</p>	<p>(xviii) FEI notes that the Review has identified the need for greater transparency of specific data on current and prospective spectrum use. The provision of information to all spectrum users about current and prospective use will offset, to some extent, the factors that militate against a more devolved approach to spectrum management. FEI see a need for a much clearer view of current use and future spectrum supply and pricing than is currently available (i.e. in the Radiocommunications Agency's Spectrum Strategy report).</p> <p>(xviii) Commercial use of spectrum mandates that quality of service can be assured. Sharing of spectrum with military applications results in unpredictable interference into services, except if the services occupy separate sub-segments. Shared applications may be considered for short range, low power, and license exempt applications.</p> <p>(xxi) The government could also permit reuse of part of the spectrum for non-marketable services to satisfy social or community obligations.</p> <p>(xxi) Economic incentives must take account of wider community interests and be focussed on specific assignments within the constraints agreed internationally for the allocation of a segment of spectrum.</p> <p>(xxii) FEI agrees with the suggestion to introduce fees and cost recovery to broadcasting spectrum usage. FEI recommend a rapid move to (more spectrally efficient) digital technology. Incentives may be required to promote digital services to the end user in order to reduce public demand for the retention of analogue services.</p>

<p>xxiii. broadcasting? What incentives might be introduced, consistent with wider broadcasting policy and the Government's approach to the funding of the BBC and its public service remit, to encourage greater spectrum efficiency by the BBC?</p> <p>Aeronautical and maritime services</p> <p>xxiv. Is this a valid description of the factors affecting use of radio spectrum by aeronautical and maritime services?</p> <p>xxv. Given the international harmonisation constraints, where could new economic incentives most encourage more efficient use of spectrum in the UK?</p> <p>xxvi. How far could changes in spectrum use charges be reflected in air traffic control fees that are passed on to users of UK airspace and landing services?</p> <p>Emergency services</p> <p>xxvii. Is this a valid description of the factors affecting use of radio spectrum by the emergency services?</p> <p>xxviii. How far can spectrum pricing influence emergency services to make efficient use of spectrum over time?</p> <p>xxix. What scope might there be for sharing of spectrum access with other users to enable more efficient spectrum use?</p>	<p>(xxv) FEI believes that the aeronautical and maritime services should be encouraged to move to (more spectrally efficient) digital technologies more quickly. FEI recognises that active international lobbying will be necessary in gaining acceptance of this concept.</p> <p>(xxvi) FEI agree with the suggestion by the Review team that benchmarking of radar spectrum efficiency, followed by spectrum efficiency based pricing, could encourage users to upgrade their equipment over a shorter period of time than would otherwise be the case.</p> <p>(xxviii) The emergency service end-user needs clear visibility of the value of spectrum in making equipment choices.</p> <p>(xxix) FEI is convinced that a single body should manage the spectrum for all users, including broadcasters, emergency services, and defence users.</p>
<p>Spectrum pricing and auctions</p>	
<p>xxx. How far have economic incentives from spectrum prices helped to encourage efficient spectrum use?</p>	<p>(xxx) Spectrum efficiency is best maximised by encouraging use, through low spectrum fees, and using technical means to increase capacity.</p> <p>(xxxi) FEI agrees that a more efficient use of the radio spectrum can best</p>

<p>xxxii. 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?</p> <p>xxxiii. What factors should determine the choice of frequencies subject to auction of licences?</p>	<p>be achieved by developing a regime for spectrum management that gives <i>all</i> spectrum users an incentive to take into account the value of the spectrum they are using. As a general principle, FEI supports the original application of spectrum pricing for spectrum management purposes (as laid down in the Wireless Telegraphy Act 1998). A move to pricing based routinely on estimated opportunity costs would be a major risk, the case for which seems difficult to make. Licence fees are effectively a tax on industry and risk impeding investment in technology and take up of new services if the levels are excessive. Given the importance of communications to the UK, much higher charges would jeopardise social benefits and improvements in the overall efficiency of UK industry.</p> <p>(xxxii) FEI is of the opinion that the greater part of the benefit of the spectrum to the Gross Domestic Product (GDP) lies in the use of the spectrum rather than in its initial pricing. Whilst pricing has a clear role in promoting improved spectrum efficiency, in some circumstances it can have an adverse impact on the broader social and economic benefits. FEI considers that high fees paid at auction reduce licensees' ability to fund the subsequent roll out of networks and applications.</p> <p>(xxxii) It is clear that the 3G auctions have affected the financial climate, while demonstrating the confidence of operators in the technology.</p> <p>(xxxiii) Considerations should be given in designing auctions to payment mechanisms and to alternative non-financial parameters such as 'speed of coverage' and 'quality of service'. The incentive is thus to develop revenue generating service as quickly as possible. Objective measures would be determined in advance and failure to meet the bid commitments could invoke financial penalties.</p> <p>(xxxiii) Auctions should only be used to resolve the problem of excess demand over supply if no other viable mechanism is available (e.g. pro-rata rationing).</p> <p>(xxxiii) Administrative management could be applied to stimulate the development of new technologies and applications. The use of appropriate advanced technology, and in the future even more advanced techniques, could deliver greater spectrally efficient per unit area, within the same geographic coverage.</p>
<p>Spectrum trading</p>	
<p>xxxiiii. Which areas of spectrum use are most amenable to and which areas offer the greatest potential efficiency gains from the introduction of spectrum trading?</p> <p>xxxv. To what extent would a move to licensing of spectrum access, as</p>	<p>(xxxiiii) By developing a more open spectrum market, for example through encouraging secondary trading in appropriate sectors, spectrum usage can be increased and spectrum availability enhanced.</p> <p>(xxxiv) Spectrum trading should be introduced in such a way that buying and hoarding of spectrum for re-sale is discouraged. Spectrum trading should be subject to interference safeguards and international allocation policies. Spectrum trading involving change of use is difficult to see as being successful in some cases, e.g. with satellite communications.</p>

<p>opposed to wireless apparatus licensing as now, facilitate spectrum trading?</p> <p>xxxv. 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?</p> <p>xxxvi. 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?</p> <p>xxxvii. What market infrastructure, such as spectrum registers and dispute resolution procedures, could facilitate spectrum trading?</p> <p>xxxviii. 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?</p>	<p>(xxxiii) It is essential to maintain strategic planning for future use of spectrum and for interoperability issues. It is also important to limit interference between services, though licensing must not be so rigid as to restrict implementation of higher value services that emerge with new technology advances.</p> <p>(xxxiv) Minimising interference between users is crucial in maximising the sharing of spectrum and coexistence between users. This would necessitate continued licensing of apparatus. However, as licences issued now do not relate to specific apparatus (or even types of apparatus), the question is unclear.</p> <p>(xxxvii) FEI proposes that the government urgently conducts a study to consider levels of tradability for spectrum. FEI would be pleased to propose terms of reference.</p> <p>(xxxvii) This study could well address market infrastructure issues. Assessment of spectrum use would help to identify those frequencies amenable to trading.</p> <p>(xxxviii) We believe there is a lot to be learnt from examination of experiences in other countries. The US has undergone some recent expensive mistakes in auctioning Spectrum.</p>
<p>The boundaries of spectrum regulation</p>	
<p>xxxix. What factors should guide regulators in setting the boundaries of licence-exempt spectrum use?</p> <p>xl. What remit should regulators hold over licence-exempt spectrum use, other than ensuring that it does not interfere unduly with licensed spectrum use?</p> <p>xli. 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</p>	<p>(xxxix) FEI is expecting a series of consultations from the Radiocommunications Agency and the Department of Trade and Industry on licence-exempt spectrum use.</p> <p>(xxxix) The public sector (including broadcasters, emergency services, and defence users) should be treated in the same manner as the private sector. Non-commercial users of radio spectrum should be given the same incentives to allocate services and upgrade to more spectrally efficient systems as commercial users.</p> <p>(xxxix) Spectrum regulation should give due regard to competition issues, which is another reason why the management of the spectrum should not be separated from the activities of OFCOM.</p> <p>(xl) Regulators should consider that license-exempt spectrum is a useful adjunct to licensed spectrum and that commercial exploitation should be sought. The wide range of low-cost, licence-exempt communications devices available enables cost effective services and applications to be</p>

<p>power characteristics of the signals concerned?</p>	<p>provided to consumers with acceptable performance. Therefore, fee-paying services should not be excluded from this spectrum although this would not imply a guarantee of service. Internationally or regionally agreed harmonised allocations should be adhered to, in order to ensure interoperability between devices.</p> <p>(xl) Additional measures may be defined by regulators to limit interference in areas where high concentrations of licence-exempt devices are expected. The question arises as to whether licence-exempt spectrum should be priced if all other spectrum is priced. There is a danger that the licence-exempt bands are seen as “escape routes” and become heavily congested to the ultimate detriment of the services that use them.</p> <p>(xli) Future developments in radio technology can provide effective mitigation of interference and improve co-existence between a wide range of services. However, service quality is determined by the level of variation of the channel in terms of delay, throughput rate and bit error rate. Therefore it is essential to consider that only services that can tolerate wide variation in these characteristics are suitable for use in license exempt spectrum. It is important to ensure that consumers (end-users) are made aware of the highly variable nature of the radio channel that they use.</p>
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