



Spectrum Pricing

**A consultation on proposals for setting wireless
telegraphy act licence fees**

Consultation document

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Summary

0.1.1 This consultation concerns Ofcom's approach to setting licence charges for wireless telegraphy act licences¹ and the use of "Administered Incentive Pricing (AIP)" in these charges (which are often also referred to as fees). It follows a study by Indepen, Aegis and Warwick Business School commissioned by the Radiocommunications Agency to review current AIP levels and the underlying methodology to value spectrum. This study's final report was published by Ofcom on 2 March 2004², including recommendations regarding the application of AIP.

0.2 Roadmap to this consultation document

0.2.1 The purpose of this consultation document is largely three-fold;

- it sets out the approach Ofcom intends to take to continue the use of AIP for setting annual fees for wireless telegraphy act licences;
- it makes proposals for updating the level of fees in the Licence Charges Regulations³ in 2005 for all licence classes (including those where AIP is not appropriate and for new types of radio use); and
- it initiates a broader discussion on longer term applications of pricing to some licence classes (primarily broadcasting and business radio).

Continued use of AIP

0.2.2 Ofcom's current approach to spectrum pricing is based on its legal powers in the Wireless Telegraphy Act 1998. An update of the reviews of this approach since 1998, together with a summary of Ofcom's continued use of AIP for spectrum pricing, is set out in section 1. Further details on the rationale for AIP and the economic arguments for spectrum pricing are given in section 2. Implementation issues related to our pricing proposals are highlighted in section 3.

Pricing proposals per licence class

0.2.3 This document sets out Ofcom's pricing proposals for wireless telegraphy act licences in 2005. Details of the specific proposals per licence class are contained in sections 4 to 7. To aid navigation of the document, the licence classes are split as follows:

- Mobile applications (section 4)
- Fixed applications (section 5)
- PMSE (section 6)
- Other applications (section 7)

0.2.4 These sections also include some minor changes to licence class structures which will be named in the Licence Charges Regulations.

¹ Wireless telegraphy act licences are granted by Ofcom under section 1 of the Wireless Telegraphy Act 1949

² 'An economic study to review spectrum pricing', Indepen, Aegis Systems and Warwick Business School, February 2004, www.ofcom.org.uk/research/industry_market_research/m_i_index/spectrum_research/independent

³ The current legislation is the Wireless Telegraphy (Licence Charges) Regulations 2002 (S.I. 2002/1700), as amended by S.I. 2003/2983 and S.I. 2003/2984)

Broader discussion on broadcasting

0.2.5 The document sets out how pricing proposals for future years are being developed. Section 8 includes a discussion on future options for applying AIP to TV broadcasting spectrum.

0.3 Proposed changes

0.3.1 The changes to spectrum fees proposed by Ofcom are outlined in exhibits 1-4 below. In summary, for many licence classes Ofcom is proposing there should be no change. Significant changes are proposed in the following key areas:

- fixed links, where we propose to increase the level of AIP;
- programme making, where we propose to increase fees to cover direct costs;
- national and regional business radio fees, where we aim to unify fees for similar classes to help the introduction of spectrum trading.

0.3.2 The approach to setting AIP fees follows the recommendations from the Indepen report of March 2004. Ofcom agrees with the basic approach outlined by Indepen; that the opportunity cost of spectrum should follow a least-cost alternative method, iterated over time. Indepen were asked to make recommendations about spectrum uses where AIP should apply, and in many cases Ofcom agrees with their recommendations. Finally the consultants were asked to give illustrative examples of how values should be calculated using the methodology. Ofcom agrees with some of the values, but in other cases has modified the models in the light of further analysis since the Indepen report.

0.3.3 Exhibit 5 summarises options for pricing in Broadcasting. The proposals in this document should be seen as a preliminary consultation on the introduction of AIP to spectrum used for broadcasting. Further consultation will be held before any proposals on broadcasting are taken forward to implementation.

Exhibit 1: Summary of Ofcom pricing proposals for mobile applications

Licence class	Proposal for 2005	Longer term proposal	Comments
Public wireless networks (2G public mobile networks)	No proposed changes to fee level.	Review of current fees in 3 years.	
Business radio (Private Business Radio, Public Access Mobile Radio, Common Base Stations, National Paging, 5.8GHz wireless access)	No major changes to fee levels. Ofcom proposes to remove the “step-in” arrangements and “choice and diversity” modifiers. These measures will start the process of removing differential fee rates, and support a more liberalised approach to spectrum licensing. A new flexible fee apportionment approach is proposed for national and regional licences to support partitioning of licences through trading.	Introduction of a population and coverage based approach to the definition of congestion and fee calculation for wide area licences following introduction of “MASTS” assignment tool. Rationalisation of licence classes to introduce more flexible and use neutral categories to better support a more liberalised approach.	The Ofcom consultation “Spectrum Liberalisation” sets out proposals to reduce or remove certain restrictions on spectrum use.
Scanning telemetry	No proposed changes to fee level.	To be reviewed in light of changes to business radio.	

Exhibit 2: Summary of Ofcom pricing proposals for fixed applications

Licence class	Proposal for 2005	Longer term proposal	Comments
Point-to-point fixed links	Ofcom proposes a revised algorithm, which will increase overall fees by about 25% but will affect each user according to the efficiency of the links.	Review of current fees in 3 years.	
Satellite services	Ofcom proposes an increase in minimum fees for permanent earth stations to ensure that direct costs are covered. Extend differential pricing formula for network licence class to include new Earth Station on Vessels and Aircraft Earth Station use. Introduce new class for earth stations working to Non-Geostationary Satellites and non-fixed satellite service.	Longer term consideration of role of AIP in shared bands also taking account of possible introduction of Recognised Spectrum Access (RSA).	Separate consultation process on RSA possibly in 2005 or 2006.
Fixed Wireless Access (FWA)	No proposed changes to fee levels.	To be reviewed in three to five years time, in the light of possible further release of spectrum in this band.	Ofcom is exploring options for making additional FWA licences available in the 3.6-4.2 GHz and 10 GHz bands. The 3.4-4.2 GHz band will become tradable in 2004.
Point to point security CCTV services	Licence class name change (formerly 'point to multi-point services 31Ghz – 31.80 GHz) but no changes to fees.		

Exhibit 3: Summary of Ofcom pricing proposals for PMSE

Licence class	Proposal for 2005	Longer term proposal	Comments
Programme making & special events	Fees will increase by 20% (averaged across fee categories) to meet the direct costs of external contractors.	Fees will increase by a further 20% (averaged across fee categories) in 2006 to complete this process.	Ofcom does not propose to implement AIP pending decisions to be made on the future management of the sector.

Exhibit 4: Summary of Ofcom pricing proposals for other applications

Licence class	Proposal for 2005	Longer term proposal	Comments
Aeronautical and maritime communications	No proposed changes to fee level. Minor structural changes in maritime licence classes.	Consider if AIP could apply to encourage efficiency.	
Aeronautical and maritime radar	No proposed changes to fee level.	Consider if AIP could apply to encourage efficiency.	Use of AIP is dependent upon result of current studies.
Government & emergency services	Comparative prices being set. New fee for Airwave network to be introduced based on methodology for the public networks.		
Science & technology	No proposed changes to fee levels. Abolish unspecified operational radio use licence class and review all non-operational development licences.		

Exhibit 5: Summary of Ofcom pricing proposals for broadcasting

Licence class	Proposal for 2005	Longer term proposal	Comments
Broadcasting – TV	No proposed changes to current fee levels.	Ofcom presents outline proposals on options for the application of AIP to TV broadcast spectrum. Further consultation on these options will be conducted as required in 2005 or 2006. Update cost-based fees where appropriate in 2006.	
Broadcasting – radio	No changes proposed to current fee levels. The current class will be widened to include Community Radio, at same fee rates as national and local radio. Verification that all current classes are included in the regulations.	Ofcom will continue to keep potential application of AIP to sound broadcasting under review. Update cost-based fees where appropriate in 2006.	

Section 1

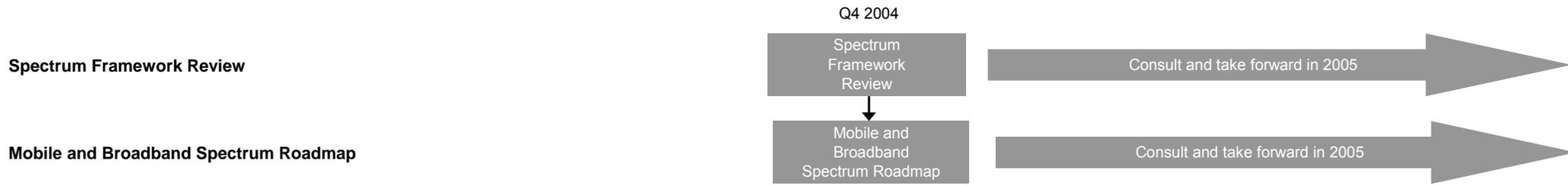
Introduction

1.1 Background to Ofcom's spectrum management approach

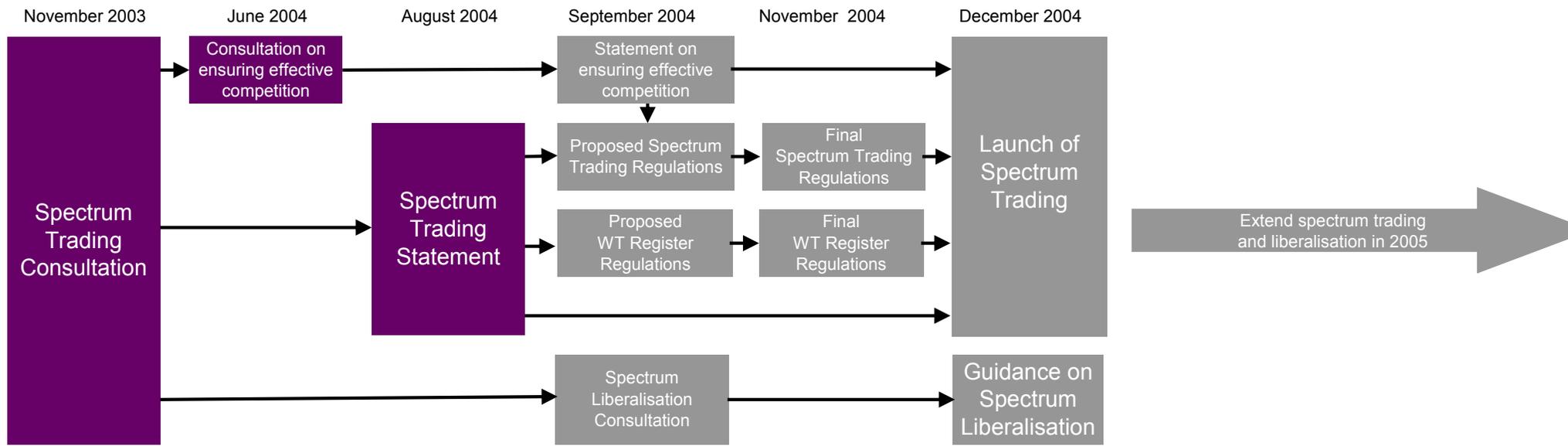
Ofcom's approach to management of the radio spectrum

- 1.1.1 This document forms one of a series setting out Ofcom's new approach to management of the radio spectrum, which is intended to promote innovation and competition in the provision of wireless services across the UK. Radio spectrum is a key raw material for the communications sector. Consumers, equipment manufacturers and network operators all stand to benefit from Ofcom managing spectrum in a way that can respond more quickly to technological and market change.
- 1.1.2 Ofcom's overall approach to spectrum management will be set out in the Spectrum Framework Review, one of Ofcom's three major reviews, due to be published in the autumn of this year. This will describe Ofcom's intended balance between command & control, market forces and licence-exempt spectrum, as well as covering areas such as harmonisation and the mechanisms by which the overall framework will be cascaded down into specific policy.
- 1.1.3 Since the Cave report in 2002, substantial progress has been made to this end. Ofcom is committed to continue the implementation of this more dynamic and market-oriented approach. Ofcom is taking forward its reform programme through three inter-related projects. These projects are:
- *Spectrum Pricing* – updating of annual fees for spectrum not acquired through auction;
 - *Spectrum Trading* – mechanisms for allowing spectrum to change hands;
 - *Spectrum Liberalisation* – relaxation of constraints on the use of spectrum.
- 1.1.4 Alongside these documents we will also be publishing for consultation a "Mobile and Broadband Spectrum Roadmap" – a joined-up approach to some immediate issues in the mobile and broadband wireless areas.
- 1.1.5 This document sets out Ofcom's conclusions on spectrum pricing. Further documents will be published in the next few months on each of the other areas, as illustrated in the timetable below.

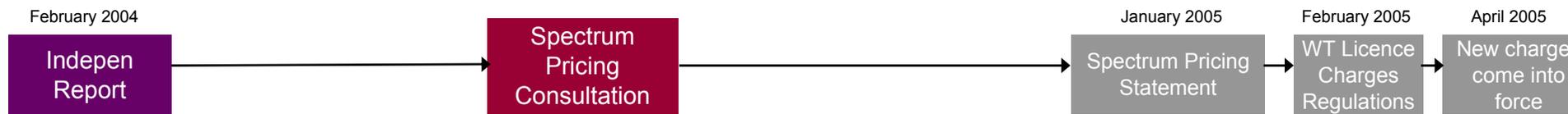
Spectrum Strategy : Ofcom Roadmap of Activities



Spectrum Trading and Liberalisation



Spectrum Pricing



1.2 Background legislative and policy framework for spectrum pricing

The Wireless Telegraphy Act 1998

- 1.2.1 The Wireless Telegraphy Act 1998 ("WT Act") was a landmark in spectrum management. It facilitated the use of market mechanisms in spectrum management for the first time in the UK. The WT Act included provisions to enable auctions to be used as a spectrum management tool to promote optimal use of the radio spectrum. Auctions have now been used in the UK on a number of occasions (for the 3G Mobile and 28 GHz and 3.4GHz Fixed Wireless Access awards), and Ofcom intends to continue using them as its preferred mechanism for awarding blocks of spectrum. Where auctions are used, a one-off payment has usually been for the full licence term (e.g. 15 years) and no further fees have been payable during that period - although the legislation permits staged payments.
- 1.2.2 Auctions are not suitable in all circumstances, for example high volume-low cost products where transaction costs can be excessive. To encourage the licensees of non-auctioned spectrum to use their spectrum rights efficiently, the WT Act enabled prices for annual licence fees to be set above administrative cost to reflect a range of spectrum management objectives (efficient management and use, economic and other benefits, innovation and competition), having regard in particular to availability and present and expected future demand for spectrum. The latter facility has been termed "Administered Incentive Pricing" (AIP). The WT Act provides that all WT Act licence fees must be prescribed in Licence Charges Regulations which include fees set by AIP. AIP has been progressively rolled out since 1998 by the Radiocommunications Agency (RA) in a series of regulations and now covers the great majority of licences. The Communications Act 2003 transferred responsibility for making these regulations to Ofcom. Ofcom proposes to make the next set of regulations to take effect in April 2005.

The NERA Smith approach

- 1.2.3 The approach used by the RA for valuing spectrum followed a model provided in 1996 by NERA and Smith Systems⁴. The NERA Smith approach was to value spectrum at its marginal value as a proxy for the opportunity cost to the representative spectrum user in those bands where AIP fees were charged.
- 1.2.4 The opportunity cost of spectrum represents the benefits that would be derived from the next best alternative use. In other words, the opportunity cost represents the benefits foregone from assigning spectrum to the best use instead of the next best use. The rationale for adopting this as the licence fee is that spectrum will thereby be directed into the best (i.e. optimal) use. The NERA Smith approach takes the opportunity cost as the cost of the least cost alternative to using spectrum that would enable the same output to be produced. This could be achieved via an alternative technology such as fibre cables in the case of fixed wireless links, or it could imply moving to a less congested spectrum band.
- 1.2.5 Setting AIP fees equal to the cost of the least cost alternative provides incentives for more efficient spectrum use within each spectrum band where the demand for spectrum is greater than the supply. Only those users for whom the spectrum is worth more than the least cost alternative will want

⁴ 'Study into the Use of Spectrum Pricing', NERA and Smith System Engineering Limited, April 1996

spectrum at that price. The other users would have an incentive to hand spectrum back to the regulator and switch to the least cost alternative. Spectrum could then be redistributed (e.g. through a re-assignment process) to those users who valued it the most.

- 1.2.6 AIP was first used for Public Wireless Networks and for Private Business Radio and introduced in step changes from 1998 to 2002. In 1999 it was extended to Fixed Links and to other mobile uses, and by 2003 most fees had been set to take account of spectrum management objectives rather than cost.

Cave Review

- 1.2.7 After the RA had rolled-out the first phase of AIP, which involved setting fees at 50% of the levels recommended by NERA Smith (as agreed by the Government at that time), the Government commissioned an independent review of spectrum management. This review was undertaken by a team led by Professor Martin Cave who reported on 6 March 2002⁵. The report recommended that greater use should be made of auctions and pricing, and, in particular, recommended:
- a. AIP should be applied at more realistic levels and more comprehensively across spectrum uses;
 - b. where AIP is already implemented and there is evidence of spectrum shortage, prices should be set at full opportunity cost level.
- 1.2.8 The Government published its response in October 2002⁶. The Government broadly agreed with the findings of the Cave report. On AIP, the Government concurred that it would be timely to review the model and the methodology for valuing spectrum and for setting fees.

Indepen report

- 1.2.9 In order to update NERA and Smith's original spectrum valuation work, the Radiocommunications Agency commissioned a study in 2003 which was awarded by competitive tender to a consortium led by Indepen and included Aegis and Warwick Business School. This study was subsequently completed and the final report delivered to Ofcom in early 2004; this was published on the Ofcom website in March 2004⁷.
- 1.2.10 The Indepen study was asked to consider which types of spectrum use should attract AIP, to review and make recommendations about the methodology used, to provide illustrations of how the methodology could be applied, and to comment more widely on the use of pricing.
- 1.2.11 Indepen largely confirmed the validity of the original NERA Smith approach. However, Indepen also widened the opportunity cost methodology, by recommending that the value of spectrum be based on alternative uses in addition to the existing use in the spectrum band. Indepen's report recommended the application of AIP to an increasing range of spectrum uses, and provided a new set of illustrative values for setting AIP based prices.

⁵ 'Review of radio spectrum management', Professor Martin Cave for the DTI and Her Majesty's Treasury, March 2002

⁶ 'Government Response to the Review of Radio Spectrum Management', Department of Trade & Industry, Radiocommunications Agency and HM Treasury, October 2002

⁷ 'An economic study to review spectrum pricing', Indepen, Aegis Systems and Warwick Business School, February 2004, www.ofcom.org.uk/research/industry_market_research/m_i_index/spectrum_research/independent

1.3 Proposed outline strategy for continuing AIP

- 1.3.1 Amendments to the WT Act by the Communications Act 2003 continued the principle that prices for licences can be administratively determined above cost recovery by reference to spectrum management objectives. However, the WT Act has been amended to update these objectives and to take account of the Authorisation Directive 2002/20/EC. The directive continues to permit the objective use of pricing to encourage efficient spectrum management⁸.
- 1.3.2 Ofcom has carefully considered the recommendations of the Cave report and also the Indepen Review and agrees that there is a continuing role for AIP, although its use should primarily be to complement and support wider policy objectives rather than be applied in isolation of them.
- 1.3.3 Ofcom proposes to amend the methodology for determining AIP, in the light of the Indepen review of spectrum pricing. Currently AIP fees are only set in relation to the value of spectrum in existing uses (the approach recommended by Smith NERA). Ofcom now proposes that each AIP fee should be set in relation to both the value of the spectrum in existing uses and its value in other potential uses for each band. Thus AIP will give incentives for spectrum to move to the most valuable uses.
- 1.3.4 Ofcom believes that AIP should continue for the foreseeable future following the advent of spectrum trading. This is because AIP can promote greater efficiency. Provided AIP fees are set conservatively, trading should not be impaired. Ofcom's Statement on Spectrum Trading⁹ provides a more detailed explanation for this decision.
- 1.3.5 Ofcom is separately consulting on liberalising the use of licence classes that are tradable. As some classes have different fees for services which may in future cross the traditional class boundaries, Ofcom proposes to ensure that differentials in fees do not obstruct these changes. Therefore, the specific proposals in section 4 include the phasing out of fee differentials in the Business Radio national classes. It is proposed to make more substantial changes in other business radio classes in the future.
- 1.3.6 In line with the policy to set AIP fees conservatively so as not to create disincentives for trading, Ofcom intends initially to set AIP fees towards the bottom of the range defined by the value of spectrum in existing uses and its value in alternative uses. AIP fees will then be adjusted towards the equilibrium level at regular review points, on the basis of market developments so that AIP fees will attach to the spectrum itself, rather than the existing use of the spectrum.

⁸ See article 13 of the Communications Directive 2002/20/EC; Fees must '*reflect the need to ensure the optimal use of [the spectrum]*' and '*such fees shall be objectively justified, transparent, non-discriminatory and proportionate in relation to their intended purpose and take into account the objectives in article 8 of Directive 2002/21/EC (Framework Directive)*'

⁹ 'A Statement on Spectrum Trading', Ofcom, 6 August 2004, http://www.ofcom.org.uk/consultations/past/spec_trad/statement/sts.pdf

Section 2

Economic approach to using AIP

2.1 Rationale and objectives of AIP

- 2.1.1 Under the Communications Act 2003 Ofcom has a general duty to promote the “efficient use and management of the electro-magnetic spectrum for wireless telegraphy; and for connected purposes”. In exercising its functions in relation to spectrum management (including its power to set licence fees), Ofcom is also required (under section 154) to have regard, inter alia, to:
- a. the extent to which the electro-magnetic spectrum is available for use
 - b. present and future demand for use of that spectrum for wireless telegraphy
 - c. the desirability of promoting
 - (i) efficient use and management of the electro magnetic spectrum
 - (ii) economic and other benefits arising from the use of wireless telegraphy
 - (iii) the development of innovative services, and
 - (iv) competition in the provision of electronic communications services
- 2.1.2 Ofcom considers that AIP is an important mechanism for promoting efficient spectrum management. This is because AIP signals to the spectrum user the opportunity cost of using the resource. The rationale for AIP is to promote the efficient use of spectrum (where it is congested) by allocating it to those who value it most. Those users to whom spectrum is worth more than the AIP fee will keep the spectrum they hold (or buy any that becomes available), and those to whom spectrum is worth less will sell any spectrum they hold.
- 2.1.3 In determining appropriate spectrum prices under AIP, the starting premise is that spectrum is a finite and scarce resource, and therefore prices should maximise economic welfare. In principle therefore, prices should be equal to the marginal benefit from using the good. This is the economic principle underpinning administrative pricing. It seeks to value the marginal benefit of the spectrum. To do this the marginal use and user of the spectrum must be identified and then the cost to the marginal user of being denied access to the spectrum estimated. This gives the marginal benefit of the spectrum.
- 2.1.4 It is difficult to identify the marginal use and user directly, without knowing first what the most efficient allocation of spectrum is (if this could easily be derived, Ofcom could just allocate the spectrum accordingly). In practice, we can estimate the marginal benefit of the spectrum to “representative” users in its existing and alternative uses. The level of AIP which promotes the efficient use of spectrum can be arrived at over time as follows: Initially AIP could be set according to the value of spectrum in its existing use. It could then be adjusted at regular review periods towards the value in the alternative use (re-calculated each time), taking into account information on changes in spectrum usage during the review period.
- 2.1.5 To estimate the marginal benefit of spectrum, it is necessary to calculate the cost of alternative means for the representative user of achieving the same output. The core purpose of administered pricing is to influence the choices made by spectrum users so that:

- Decisions on spectrum use reflect the value of that use;
- Users of the spectrum consider alternative means of communication - not necessarily requiring access to the radio spectrum - and seek to avoid use of the most congested frequencies;
- Existing users examine their spectrum needs and shed surplus spectrum;
- New entrants and new technologies have a greater chance of gaining access to the spectrum if their use has a higher potential value.

2.2 Three types of efficiency

2.2.1 Economic efficiency can be looked at in three different ways relating to consumption, production, and the use of resources over time. The methodology for setting AIP fees will depend on which of these definitions of efficiency we are aiming for. The three definitions of efficiency are:

- **allocative efficiency** – an allocation of inputs that maximises the value of goods and services produced such that no other allocation can increase the well-being of one economic agent without harming that of another
- **productive efficiency** – an allocation of inputs in the production of goods and services that produces a given level of output at the lowest possible cost
- **dynamic efficiency** – inputs are allocated to the production of goods and services over time so that productive and allocative efficiency are maintained in response to changes in technology or consumer preferences.

2.2.2 Pricing can promote the attainment of **allocative efficiency** by reflecting what those who value spectrum most highly are willing to pay to use it. Prices set at the appropriate level will ration demand, so that only those who value an additional unit of spectrum more than the price charged for it will demand more spectrum. When price reaches the level at which the demand for spectrum from alternative uses matches its supply, the marginal benefit of spectrum should be equal across those uses and the allocation of spectrum should be efficient (externalities may affect this and will be discussed later). In other words, it would not be possible to increase the total value generated from the spectrum by re-allocating spectrum from one use to another.

2.2.3 Pricing can achieve **productive efficiency** by reflecting the opportunity cost of using spectrum, for a given level of output. The opportunity cost of spectrum is its value at the margin in terms of the cost of other inputs saved by using the spectrum, while keeping output constant. Setting price equal to the opportunity cost encourages productive efficiency by creating incentives for users to minimise the cost of producing a given level of output. One measure of the marginal benefit of using spectrum (assuming output is held constant) is the cost saved by using a marginal unit of spectrum, e.g. not having to install more base stations. If the marginal benefit to a user is less than the opportunity cost of the spectrum, the user will have an incentive to give up spectrum. When the use of spectrum across the economy is optimal, the marginal benefit of spectrum across competing uses should be

the same, implying that the cost of producing a given set of outputs could not be lowered by re-allocating spectrum¹⁰.

- 2.2.4 **Dynamic efficiency** can be promoted by adjusting prices regularly - on the basis explained above - to take account of changes in the market. Ofcom proposes to review AIP levels every 3 to 5 years, depending on the specific licence class. Regularly reviewing AIP levels would enable it to reflect such developments and help ensure dynamic efficiency in the use of spectrum. This also fits in with Ofcom's duty to promote innovation.

2.3 Taking social benefits into account

- 2.3.1 Ofcom has the power to set AIP fees to take into account objectives other than promoting efficiency. Ofcom can set AIP levels to promote "economic and other benefits" e.g. social benefits and costs. Ofcom should consider whether it would be more effective and efficient to address social benefits/costs through AIP or through existing policy tools.
- 2.3.2 Some Ofcom stakeholders have argued that AIP should take into account the social benefits (and costs) associated with the use of spectrum by certain services, most notably the public service aspects of broadcasting, but also social benefits associated with emergency services. Since Ofcom intends that AIP fees will reflect the demand for spectrum from competing uses, it could be argued that if AIP ignores social benefits, the benefits of spectrum to the economy and society may not be maximised.
- 2.3.3 Indepen addressed this issue in their review of spectrum pricing. Following the work of Diamond and Mirrlees¹¹ they concluded that it was better to address externalities such as social benefits by subsidising prices charged to end users rather than by subsidising the price of inputs such as spectrum.
- 2.3.4 Ofcom believes that in general the approach suggested by Indepen is likely to be the better way forward. There may be adverse effects on efficiency if AIP is applied in a way that seeks to promote particular social benefits, and public policy goals may be better pursued through adjusting end-user prices or using other policy tools such as direct intervention. Whatever instrument is used, it is important that a proper consideration of costs, benefits and alternatives is undertaken before the decision is made.

2.4 Application of AIP

- 2.4.1 The demand for spectrum, like any good, can potentially vary with its characteristics, location and even the time of day or year. This determines how AIP can be applied to spectrum.

¹⁰ Productive efficiency is a necessary condition for allocative efficiency. However while productive efficiency concerns how goods and services are produced, allocative efficiency also concerns maximising the value of those goods and services produced to consumers. Therefore productive efficiency is not sufficient by itself to ensure allocative efficiency.

¹¹ 'Optimal taxation and public production 1: Production efficiency and 2: Tax rules' American Economic Review, vol. 61, Peter Diamond and James Mirrlees, 1971. This work proved that, in competitive markets, if the prices of inputs are set so that a given level of output is produced at the minimum cost (productive efficiency), then retail prices can be adjusted by subsidies so that social benefits are taken into account in markets for end-user goods and services.

- 2.4.2 **Characteristics** - low frequencies, such as those used for national radio stations, travel much further than high frequencies, such as those used for high speed wireless broadband services. Thus the potential uses of a block spectrum will depend on frequency and this will be reflected in its value and the AIP that attaches to it.
- 2.4.3 **Location** - the extent to which the demand for a block of spectrum varies by geography depends a lot on its potential use. Private business radio services, such as those used by a large retail store, may only be required for a limited geographic area. Broadcasting in contrast can be both local and national. AIP can therefore be charged on a local, regional or national basis. For local areas, a standard geographic area could be defined, or AIP could be set as proportion of the national value depending on the service area¹².
- 2.4.4 **Time** - typically licence fees are not set at different rates depending upon when spectrum is used. However, some charges are set pro rata according to how long spectrum is used. Intermittent users of spectrum, such as outside broadcasters at a sports event, are charged (cost recovery fees at the moment) on the basis of to the duration of their use of the spectrum. Under new proposals, classes where AIP is applied will also be able to be time-divided.
- 2.4.5 Following the advent of trading, licences may be partitioned by frequency, geography, or period of use. AIP could then be set for each new licence according to how the licence had been split. This is discussed in more detail in section 3.4.

¹² In practice this is determined as the area in which other users would not be able to operate because of interference and is called the area sterilized by the service.

Section 3

Implementation issues

3.1 Introduction

- 3.1.1 This section discusses a number of implementation and spectrum trading payment issues:
- *Payment dates*: is there a need for spread payments and adjusted payment dates?
 - *Mechanisms for facilitating spectrum trading*: how can fees be adjusted to reflect licences which are partitioned?

3.2 Payment dates

- 3.2.1 The current arrangements are to collect fees on the issue of a licence or the anniversary of issue thereafter, unless a new date is requested. Current regulations permit charges for the annual fee of most business classes and fixed services to be divided by 12 to facilitate date adjustments and we propose to continue this facility. Ofcom generally finds a spread of dates easiest to manage, but for some large licences there may be advantage in payments being coordinated to the same date. Licensees may request their payment dates for any of these classes to be changed if they would find this helpful.

Question 1

Do you have any views about payment dates other than the licence anniversary?

- 3.2.2 Ofcom also has facilities for spreading payments over the year for certain large licences where the fee is over £100,000. During the first year of operation Ofcom has experienced some difficulty with some licensees taking this option but failing to make all the payments, in which event Ofcom requires the non-payers to make a full and final payment, or lose their licence. Nevertheless, Ofcom would be interested to have views on whether this facility should be retained, and if so, extended.

Question 2

Do you have any comments on the threshold for permitting spread payments?

3.3 Mechanisms for facilitating partitioning of tradable licences

- 3.3.1 In Ofcom's statement on implementing spectrum trading (see footnote 9), reference was made to the need to be able to adjust fees to reflect the fact that some tradable licences can be partially transferred from 2005 - and therefore may need to be partitioned. Three ways of partitioning a licence were described:
- **Division by geography** - the aim is that national licences should be able to be subdivided in some way (e.g. a UK licensee trades the frequencies for Northern Ireland, or a small subdivision). Ofcom proposes that annual licence fees should be proportioned. Current Regulations divide regional proportions so that England attracts 13/20 of the UK rate, Scotland 3/20, Wales 2/20 and Northern Ireland 2/20. For smaller geographic units, Ofcom proposes to use proportions

based on a population (with 500,000 population as a minimum unit for administrative convenience) as an additional method of division within nations. Geographic partitioning may not be in place until later in 2005, when the IT arrangements are ready.

- **Division by frequency** - Most fees for mobile bands are based on fees calculated on multiples of 12.5 kHz divisions as rastered¹³ in the frequency allocation tables. If as a result of licence partitioning frequencies were assigned in other units, Ofcom proposes to calculate fees pro-rata to the frequency range assigned.
- **Division by time** - This could be divided in three ways. Firstly a licence could be temporarily transferred for a set period (e.g. 4 months out of a year for a seasonal use). Secondly it could be for a set number of days per week (e.g. Saturday and Sunday each week) or hours per day. Or thirdly by a dynamic time division technology which enables simultaneous sharing. In such cases Ofcom proposes that licence fees be proportioned on a pro rata basis (to the nearest 5 % for administrative convenience, so Saturday and Sunday use would be counted as 30%).

3.3.2 It is proposed that these three mechanisms would apply to the list of national and regional classes covered by Licence Charges Regulations which will also be included in the Trading Regulations. These are all in the Business Radio licence class outlined in section 4 and the Fixed Wireless Access classes in section 5 below.

Question 3

Do you agree that fees for partitioned licences be apportioned by population, frequency or time proportion in the units exemplified?

¹³ "Rastered" means organised in precise allocations between specific spot frequencies.

Section 4

Pricing proposals for mobile applications

4.1 Introduction

4.1.1 This section covers pricing proposals for the following mobile applications:

- Public wireless networks (2G public mobile network operators)
- Business radio (including PBR, PAMR, CBS and National Paging)
- Scanning telemetry

4.1.2 Ofcom would prefer to set AIP charges for mobile spectrum on the basis of updated valuations of the opportunity cost in order to promote efficiency, just as for other licence classes. However, Ofcom expects that the mobile sector will experience potentially significant changes in the coming three years, which introduce considerable uncertainty in the calculation of the current and future opportunity cost. For example, changes in 2G network planning and congestion as a result of the potential growth of 3G services could have a major impact on the opportunity cost calculation for 2G spectrum. Since the scale of these changes is so uncertain, there is a major risk that setting AIP fees with the information available now could result in a serious error in estimation. If, in three years' time, AIP fees needed to change significantly because of this misestimate, the disruption to business might have a worse impact on efficiency than holding AIP fees at their current level and reviewing these in 3 years time when the uncertainty is reduced.

4.1.3 In addition, Ofcom intends to release more spectrum suitable for mobile applications, such as the re-assigned Public TETRA spectrum, over the next 18 months. This further strengthens the case for waiting till the next review period to adjust AIP charges for mobile spectrum, because the release of further mobile spectrum may have an impact on the value of existing mobile spectrum, though the impact is uncertain. Given the particular uncertainties that exist for now, Ofcom considers it better to wait to get a market valuation of this additional spectrum and then assess the implications for existing mobile spectrum, rather than second-guess the impact.

4.2 Public wireless networks

Current position and charging

4.2.1 In 1996, Smith-NERA estimated the marginal value for the public wireless network licences in the 900MHz band to be £1.625m per 2x1MHz (see footnote 4) – more than 10-fold higher than licence fees at the time. However, during the passing of the Wireless Telegraphy Act of 1998, the Government gave an assurance to Parliament that AIP levels would only be implemented up to half this calculated market price level. Further increases would be dependent on review.

- 4.2.2 Currently, AIP fees are set at £0.712m for the 900 MHz licences, and £0.554m for the 1800 MHz licences - at approximately half of the Smith-NERA recommended fee. 1800 MHz licensees received a further discount to take into account the differences in the coverage of 900MHz and 1800MHz bands. Total 2G fees for 2004 – collected from O2, Vodafone, Orange and T-Mobile – add up to just over £60m.

Indepen's recommendations

- 4.2.3 In contrast to the current pricing regime, Indepen proposed the setting of one value for spectrum in both 900 MHz and 1800 MHz bands as they considered the marginal value to be the same. The Indepen report explains that the modifier set previously is no longer relevant, as the coverage requirements are fully met in the now mature networks.
- 4.2.4 Indepen's central estimate for the marginal opportunity value per 2x1MHz amounts to £1.68m. This recommendation represents a significant increase over the current public wireless licence charges; at 136% for 900MHz licensees, and 203% for 1800MHz licensees.

Reactions and developments following Indepen

- 4.2.5 Since the publication of Indepen's study, Ofcom has been involved in detailed discussions with the 2G operators regarding the study's recommendations. As acknowledged by Indepen, its recommended AIP value is sensitive to underlying assumptions regarding the network – specifically the level and density of network traffic. As these and other inputs into the Indepen model have been questioned by the 2G operators, Ofcom has undertaken a more refined analysis of the marginal value calculations, with input from the mobile operators.
- 4.2.6 Although it is agreed that the refined marginal value model gives a better representation of the actual situation in the mobile operator's networks, the model is still sensitive to its underlying assumptions: relatively small changes in inputs can produce AIP levels both significantly below and above the current AIP levels. However, the range of AIP levels produced is significantly below Indepen's recommended value of £1.68m per 2x1 MHz.

Specific proposals for charging

- 4.2.7 Ofcom proposes no change in fees for 2G mobile network operators for the next 3 years. Whilst the Indepen spectrum valuation model indicated increases in 2G spectrum fees would be appropriate, it has become clear from work done by Ofcom since then that the proposals made by Indepen need revision. A more refined analysis suggests that an appropriate level of AIP may in fact be similar to the level of current fees.
- 4.2.8 At the same time, now is a particularly uncertain time in the life of mobile service markets, with the commercial launch of 3G services coinciding with potential new competition from services based on alternative technologies such as WiFi, and the impending release of additional spectrum suitable for the provision of mobile services.
- 4.2.9 In the light of this further analysis, Ofcom proposes to maintain the current fees for 2G spectrum for a period of three years, and to revisit the situation in 2007/08, by when a number of key uncertainties should have been resolved. Ofcom believes that this approach provides an appropriate balance between promoting the efficient use of spectrum through revisions to AIP and through greater regulatory certainty.

Question 4

Do you agree with the proposal for public wireless networks to maintain the current fees?

4.3 Business radio

4.3.1 The business radio sector covers a range of licence classes, including Private Business Radio (PBR), Public Access Mobile Radio (PAMR), Common Base Stations (CBS), National Paging and Data Networks. Ofcom proposes to move towards a more liberalised spectrum environment with greater freedom as to the use and technologies that licensees can apply – as set out in a separate consultation on liberalisation published on September 17th¹⁴. This will require a longer term review of the current licence and fee structures.

Current position and charging

4.3.2 Since the introduction of AIP, business radio has increasingly used the economic valuation of spectrum as a basis for setting fees for its licence products. The first wave of administered pricing began in July 1998 and tackled the worst distortions of the previous cost-based regime by increasing fees for mobile telecommunications networks and reducing fees for thousands of users of on-site private business radio. The second wave enabled smaller private business radio users to continue to benefit from fee reductions outside congested areas. The marginal values calculated for mobile radio differed between services and an average ‘Spectrum Tariff Unit’ was applied consistently to all mobile radio services. This amounted to approximately £1.65/MHz/km².

Indepen’s recommendations

4.3.3 **Public Business Radio (PBR).** In its report published in March 2004, Indepen calculated a marginal value for spectrum based on an assumption that in the Business Radio sector, the least cost alternative for PBR users would be to switch services to an alternative non-congested band. The resulting calculation gave a marginal value of spectrum of £2,578 for a 25 kHz channel, with a national operational area of 30 km and sterilised area of 60 km. This base value was further modified to reflect the ability for the channel to be re-used and to take account of the varying geographic demand for PBR services, giving a spectrum valuation of £15,468 per national 2 x 12.5 kHz channel. This valuation is less than the values produced by the earlier work performed by Smith NERA on behalf of the Radiocommunications Agency in its introduction of AIP, which had given a valuation of £22,000 for a national channel – but is more than the fee agreed by government of £9,900.

4.3.4 **Common Base Stations (CBS) and National Paging.** The characteristics of National Paging and Common Base Station services are broadly similar to the PBR services and Indepen recommended therefore, that the values described above should also apply to these services. Currently, these services have a fee of £9,900 for a national 2 x 12.5 kHz channel.

4.3.5 **Public Access Mobile Radio (PAMR).** The Indepen report contains calculations of the costs that might be avoided by a PAMR operator as the

¹⁴ ‘Spectrum Liberalisation; a consultation on proposals to reduce or remove certain restrictions on spectrum use’, Ofcom, September 17th 2004, <http://www.ofcom.org.uk/consultations/current/liberalisation/>

result of a small increase in spectrum. The value obtained through this process, which assumes additional spectrum substitutes for infrastructure in 'urban hotspots', gives a marginal value of £32,000 for a 2 x 25 kHz channel. This value is similar to the fee calculations carried out by Smith NERA in the first moves towards AIP which resulted in a £34,000 valuation, but is less than the current fee of £25,000 per 2 x 25kHz channel.

- 4.3.6 In its report, Indepen recommended that Ofcom should move quickly to a situation where it can identify the area sterilised by a licensed PBR system and suggested that an appropriate criterion for defining this area would be a field strength contour. It further recommended that by combining a population database with its coverage planning tools, Ofcom would be able to determine a congestion factor according to the population residing within the bounded contour, and set a price accordingly.

Specific proposals for setting fees in 2005

- 4.3.7 Ofcom has decided not to raise the Spectrum Tariff Unit (STU) for mobile radio in order to ensure that rates for national channels remain consistent with those for other mobile services. Ofcom proposes to continue to use the STU valuation of £1.65/ MHz/ km². Although the basic STU value will not change, individual fees could be affected by proposed plans for licence restructuring (depending upon options outlined below).
- 4.3.8 In order to support its liberalisation initiative, Ofcom proposes to evolve licence structures and charging arrangements for business radio to support the new flexibilities and freedoms it intends to provide to spectrum users. As a first step in this process Ofcom proposes to move towards a single licence class and fee replacing a range of existing national and regional licence classes¹⁵. This would better support increased flexibility across spectrum use in these areas. Ofcom recognises however, that different fee levels currently apply to certain of these licence classes, as some licence classes attract fee modifiers.
- 4.3.9 **"Choice and diversity" factor.** "Choice and diversity" factors were introduced to promote the use of certain services in business radio spectrum to provide choice and diversity to the public. For example, PAMR and CBS fees attracted a "choice and diversity" factor of 0.7 (i.e. a 30% discount). Under Ofcom's current proposals to move to a single licence class, it would be inappropriate to charge differential fees for different uses of spectrum within this licence class. Therefore, Ofcom proposes the removal of this type of fee distinction.
- 4.3.10 **"Step-in" arrangements.** Ofcom also proposes to withdraw "step-in" arrangements, which currently provide new licensees with a four to five year escalator up to full spectrum fees. Existing licensees will not be affected by this proposal since they have all reached the maximum fee level. Ofcom considers that all spectrum users should be subject to the appropriate AIP fee for their spectrum use, and does not want to distort competition in the spectrum market by having different fees for different licence holders.
- 4.3.11 **Band modifier.** Ofcom does not propose to remove fee modifiers which are frequency band specific, such as those designed to address technical limitations on specific spectrum bands and congestion factors. These modifiers ensure that licence fees encourage use of less congested

¹⁵ Existing national and regional licence classes include PBR, PAMR, National Paging and data networks.

spectrum if possible, and that fees properly reflect any technical limitations on the use of a particular piece of spectrum such those that might arise from international coordination constraints. Ofcom intends to continue to apply these band specific modifiers at a level as currently defined for the national and regional PBR licence class.

- 4.3.12 Ofcom believes that these changes are important to support enhanced flexibility for spectrum users in a transparent and fair fee structure. It also recognises that the proposals set out above will result in an increase in fees for some licensees. In view of the potential impact of these changes upon some licensees, Ofcom invites comments upon three options for implementation, as presented in exhibit 6 low.

Exhibit 6: Options for implementing Ofcom business radio proposals

Option	Benefits	Risks
1. The phased implementation of the proposals over the next two years	Easier for existing business radio users to adjust to new fees. Fairest way of achieving consistent rates.	Takes longer to realise full advantages of moves between licence classes.
2. The immediate implementation of these proposals	Realise full benefits of spectrum liberalisation quickly. Same fees for all users.	Business radio operators (as in note ¹⁵) face a sharp increase at a time of significant uncertainty.
3. Maintenance of the current licence and fee structure	No change for existing business radio operators.	Deters any movement towards liberalisation of use. Does not encourage efficient spectrum use.

- 4.3.13 Ofcom proposes the implementation of the first option, whereby business radio moves towards a single licence class and fee, and whereby both the "choice and diversity" factor and the "step-in" arrangements are abolished over two years.

Question 5

Do you support Ofcom's proposal to abolish the "choice and diversity" factor and the "step-in" arrangements in the business radio sector over 2 years (as in option 1)?

Partitioning of tradable licences

- 4.3.14 The proposed approach towards fee calculations, based upon population covered (sterilised), provides Ofcom with the necessary mechanism for partitioning licences geographically. This approach will apply only to business radio licences which are tradable: in 2004 tradable business radio licence classes are analogue PAMR, national paging, national and regional PBR¹⁶; in 2005 these will be extended to include wide area PBR, on-site PBR and digital PAMR. However, necessary IT arrangements to enable geographic partitioning may not be in place until later in 2005.
- 4.3.15 Further details on Ofcom's plans regarding mechanisms to facilitate the partitioning of tradable licences - in terms of geography, but also in terms of frequency and time - are set out in section 3. All these proposed partitioning mechanisms apply only to tradable licences.

¹⁶ CBS is tradable in 2004, however, it is not partitioned or charged on a population basis.

Future plans

- 4.3.16 In 2005 Ofcom does not propose to make any changes to the structure or fees of Wide Area or On-Site Licences. However, in the future Ofcom will seek to achieve consistency between fees for CBS and Wide Area licences once the new assignment tool (MASTS) is in place.
- 4.3.17 Ofcom proposes to restructure its approach to calculating business radio fees over the coming years, building on the recommendations of the Indepen review to move towards a population coverage fee calculation approach. In this approach the fee would be calculated by consideration of the population residing within a defined coverage area. Ofcom recognises the value to be gained from such an approach, which would provide an incentive for spectrum users to use their spectrum as efficiently as possible and minimise their sterilisation of unutilised spectrum.
- 4.3.18 When setting fee levels for licences calculated in this way Ofcom would take into account the level of sharing the licensee would experience in their spectrum and also the level of congestion associated with particular frequency bands.
- 4.3.19 Introduction of these new approaches will require the development of new tools and information systems necessary to achieve these changes for the large volumes of licences in the Business Radio sector. Similarly, current approaches to spectrum assignment will also need to evolve in order to support these new developments.
- 4.3.20 There are a number of existing licences in the PBR sector where Ofcom wishes to explore the possibilities of moving to licence-exemption. These include PBR licences in the On-site category with a coverage area of up to 1Km¹⁷ as well as the self-select Private Business Radio Licence, the Private Business Radio Suppliers Licence and the PMR Standard Licence.
- 4.3.21 This review is currently scheduled for autumn 2004 and Ofcom will be engaging in a dialogue with trade bodies and user representatives. Fees for the licences involved will remain unchanged for now pending the outcome of the review.

Question 6

Do you support this long-term phased approach for simplifying business radio sector licences?

4.4 Scanning telemetry

Current position and charging

- 4.4.1 Scanning telemetry systems are subject to AIP, with phasing in arrangements for significant users. The Radiocommunications Agency previously implemented this pricing regime in two steps in July 2001 and 2002, which is based on the pricing regime used for PBR services (now part of the business radio licence class). Scanning telemetry pricing mirrors business radio pricing as Scanning telemetry systems are fixed services which utilise spectrum in a way similar to business radio.

¹⁷ including 'Speech and Data Systems', 'Local Communications Systems', 'Hospital Paging and Emergency Speech', and 'One-way Paging and Speech'.

Specific proposals for charging

4.4.2 Ofcom proposes to continue the current pricing arrangement without any changes this year. It is proposed that as business radio is further streamlined, equivalent changes may need to be considered for scanning telemetry. Otherwise the class will be left unchanged.

Question 7

Do you agree with the proposals for not changing scanning telemetry fees?

Section 5

Pricing proposals for fixed applications

5.1 Introduction

5.1.1 This section covers pricing proposals for the following fixed applications:

- Point to point fixed links
- Satellite services
- Fixed Wireless Access (FWA)
- Point to point security CCTV services

5.2 Point to point fixed links

Current position and charging

5.2.1 Fixed links licensees are already subject to AIP. The current pricing regime, introduced by the Radiocommunications Agency (RA) in four stages between July 1999 and July 2002, was kept as simple as possible. Previous consultative documents highlighted that the basic pricing algorithm would need to be refined once the initial implementation programme had been completed. However, no changes have been made to the fees since the final stage in July 2002.

New products, trends and developments

5.2.2 Although no changes in actual fixed link fees were implemented following the July 2003 fees review, significant developments to the concept of the fees algorithm did occur. Against a background of increasing demand for fixed link spectrum, the RA totally revised the basic algorithm to include a full range of the factors that influence spectrum usage in the terrestrial fixed links sector. This was intended to generate a cohesive approach across all fixed links frequency bands, with the intention of removing anomalies between individual fee levels in different bands. At that time the RA also took the opportunity to review the definition of congestion by proposing to move away from a coarse approach based on grid squares, to an approach based on precise nodes. An early draft of the proposals was discussed with the industry, whose comments and suggestions were included in an amended proposal.

5.2.3 However, with the launch of Ofcom in December 2003, the July 2003 fees proposal was scaled back, and the revised fixed links fees algorithm proposals were 'parked' until the current Ofcom fees review.

Specific proposals for charging

5.2.4 The proposals presented in this consultation document take the July 2003 RA proposals and develop them further in the light of the recent Indepen report. Feedback from industry has been received through bilateral meetings to discuss the recommendations contained within the Indepen report.

5.2.5 The new proposed fixed links fees algorithm is as follows:

Fixed link licence fee =	$Spectrum\ Price \times Band\ Width\ Factor \times Band\ Factor \times Path\ Length\ Factor \times Availability\ Factor \times Antenna\ Factor \times Sharing\ Factor$
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5.2.6 This algorithm aims to ensure more efficient use of the fixed link bands through a combination of factors. With the exception of the bandwidth factor which reflects the amount of spectrum used, the remaining factors adjust fees both up and down in accordance with good spectrum management principles. The table below gives a brief explanation of each factor and its purpose in the algorithm. A more detailed explanation of each of the factors is given in the Annex 4 'Fixed links algorithm'.

<i>Spectrum Price</i>	Price for each unit of link bandwidth: £99 per 2 x 1 MHz
<i>Band Width Factor</i>	Promote the use of lower-bandwidth channels so that users are encouraged to utilise the minimum necessary spectrum to achieve their requirements: charge bandwidth per MHz
<i>Band Factor</i>	Adjust the licence fee to reflect the degree of re-use possible within the band and the potential to cause interference in the chosen band; the higher the frequency band, the lower the value of the Band Factor
<i>Path Length Factor</i>	Encourage assignments in the highest available fixed link frequency band to ensure the lower frequencies are kept for the longer links which are only achievable using the lower frequencies. Links shorter than the minimum path length are charged a premium
<i>Availability Factor</i>	Encourage efficient behaviour by making users aware of the impact availability has on spectrum use and associated opportunity cost: varied charging for availability requirements other than 99.99%
<i>Antenna Factor</i>	Encourage use of higher-performance antennas by making users aware of the impact on spectrum use and associated opportunity cost: calculate bore-sight gain ratio
<i>Sharing Factor</i>	Encourage site sharing for public policy reasons relating to environmental and social benefits: a 50% discount is given where operators share a site

5.2.7 One of the most significant changes in this algorithm is the replacement of the previous 'Reference Fee' for a hypothetical reference link with a 'Spectrum Price' for each unit of link bandwidth. Furthermore, a minimum fee of £150 has been introduced to cover Ofcom's administrative costs where the calculated fee for individual assigned links is very low.

5.2.8 Overall, it is estimated that the introduction of the proposed fee calculation algorithm will result in an increase of around 25% in the total fixed links sector income, which is considered reasonable given the last general increase was implemented in July 1999. However, as shown in the example fees table in Annex 5 'Financial impact of fixed links proposal', there will be a range of increases and decreases across the bands in respect to current individual link fees. Where appropriate, a phased implementation of any significant increases of fees may be considered.

Question 8

Do you agree with the proposed algorithm for point to point fixed links?

5.3 Satellite services

Current position and charging

5.3.1 AIP is currently applied to the licence products for permanent and transportable earth stations and VSATs. The licence fees are based on algorithms incorporating the bandwidth to which access is authorised, the peak transmit power and a number of modifiers used to capture aspects of satellite operation that might affect the spectrum access denied to other users. Various incentive elements reflect the concentration of earth stations within limited geographic areas and restriction of the operating frequencies to those bands that are not shared with other services. Further details on this algorithm and its elements are provided in Annex 6.

New products, trends and developments

5.3.2 New licence products have recently been developed for earth stations on board vessels (ESVs) and aircraft earth stations (AESs), both operating within the satellite exclusive band at 14-14.25 GHz. ESV and AES licence products will be introduced on a temporary basis with a view to making them licence exempt in the near future. The Ku band will be the first of these to be made licence exempt. This band has a European wide agreement for satellite use, so there are no coordination issues. Other bands such as C band are shared with fixed link users, and so there are potential interference issues that need to be considered. The licence exemption process will begin with a consultation document due to be published later this year.

5.3.3 Other new licence products and systems are also being considered. A new licence product might better serve applications such as VSATs (Very Small Aperture Terminals) installed on mobile platforms (e.g. fire engines). These are currently treated as transportable earth stations, but this does not adequately reflect their method of operation. In addition to this, systems are under development to offer high-speed Internet services to other platforms including railways and road transport. The approach to handling these new services will be addressed separately over the next year.

5.3.4 New Earth station licence products have been developed for the emerging markets for Earth Stations working to:

- a) Satellite Earth Station (Non Geostationary Satellite), and
- b) Satellite Earth Station (in the non-fixed satellite service).

5.3.5 These two licence products will be reviewed as the requirements for these emerging markets become clearer.

Indepen's recommendations

5.3.6 The Indepen report suggested that AIP should only be applied to frequency bands where satellite services share with other radio services. The opportunity cost of spectrum in exclusive bands is considered to be zero, as such bands are allocated internationally on an exclusive basis. Therefore, the role of AIP to promote more efficient spectrum use in such bands is less compelling.

5.3.7 One exception to pricing by the above-mentioned algorithm is the mobile satellite service at L band where both orbital slots and spectrum constrain the number of operators that may use the band. The ITU is putting in place procedures to improve rationing of demand for slots although it is not yet

known how effective these will be. Auctions may be used to assign spectrum allocated to national governments.

- 5.3.8 Furthermore, recommendations in the Cave Review highlighted the case for introduction of spectrum access licensing to clarify the rights and responsibilities of satellite transmissions originating outside the UK but intended for reception within the UK. The Government accepted this recommendation which is reflected in the 'Recognised Spectrum Access' (RSA) provisions of the Communications Act 2003.

Specific proposals for charging

- 5.3.9 It is proposed that the licence fees for satellite earth station licence products remain the same¹⁸, except that the minimum fee for a permanent earth station increases from £175 to £500 in order to recover direct administrative costs. It is proposed that the licence fees for transportable and network licences remain unchanged.
- 5.3.10 The proposed annual license fees for the new licence products ESVs and AESs are based on bandwidth and power factors, assuming a single nominated point and a minimum number of 50 terminals. The fee algorithm applied will be similar to that of the existing satellite network licence, see Annex 6 for the algorithm and an explanation of its elements.
- 5.3.11 The proposed annual licence fees for new licence products for Satellite Earth Station (Non Geostationary Satellite) and Satellite Earth Station (in the non-fixed satellite service) is £500 per annum, in order to recover direct administrative costs.

Question 9

(a) Do you agree with the proposals to make no changes to licence fees for satellite services – except an increase in the minimum fee to cover costs?

(b) Do you agree with the proposed fees for the new licence classes within satellite services?

Future plans

- 5.3.12 The growing demand for satellite systems operating within the exclusive 14GHz satellite allocations, including VSATs, Aircraft Earth Stations (AES) and Earth Stations on board Vessels (ESV), highlights the likelihood of congestion in these bands in the future. It is therefore planned to undertake a review of the application of AIP and of the current fee structure to earth station licence products in this and other exclusive satellite bands.
- 5.3.13 It is intended that this review is carried out during 2005, with a view to introduce any subsequent changes in 2006. The review will look into some of the issues raised by the Indepen report, will re-examine the satellite fees algorithm and its application, and will take into account the feasibility of encouraging suitable applications to migrate to higher frequency bands. Proposals will be discussed with satellite stakeholders at the Satellite Coordination Committee (an Ofcom stakeholder consultative committee).
- 5.3.14 It is anticipated that a consultation on the application of RSA to satellite services will be conducted during 2005 or 2006.

¹⁸ The same as in Statutory Instrument 2003 No. 2983 – The Wireless Telegraphy (Licence Charges) (Amendment) Regulations 2003.

5.4 Point to point security CCTV services

- 5.4.1 Ofcom does not propose to make any fee changes in this licence class. However, it does plan several changes to licence product and sector titles. Ofcom plans to change the former licence class title 'point to multi-point services 31.00GHz - 31.80 GHz' into 'point to point security CCTV' services.

Question 10

Do you agree with the proposal not to make any fee changes for point to point security CCTV services?

5.5 Fixed Wireless Access (FWA)

Plans for consistent renaming of licence classes

- 5.5.1 There are currently a number of classes that fall under the broad banner of Fixed Wireless Access (FWA), contained in different sectors. Ofcom proposes to group all these classes together in a new FWA sector, with consistent naming conventions.
- 5.5.2 Ofcom plans to simplify the naming of these sub-classes by referring to all these classes as FWA, followed by the band the sub-class is in. Exhibit 7 below gives an overview of the current names of the different FWA sub-classes, and of Ofcom's new terminology.

Exhibit 7: Ofcom plans for simplifications of FWA sub-class names

Current licence sub-class name	New terminology
Public FWA (PFWA) 3.4 GHz	FWA 3.4 GHz
Public FWA (PFWA) 3.6 GHz	FWA 3.6 - 4.2 GHz
Radio Fixed Access 10 GHz	FWA 10 GHz
Broadband FWA 28 GHz	FWA 28 GHz

Specific proposals for charging

- 5.5.3 Licences in FWA 3.4 GHz and FWA 28 GHz have been assigned through an auction procedure, and therefore AIP does not apply here. Ofcom is exploring options for making additional FWA licences available in the 3.6-4.2 GHz and 10 GHz bands. We are also planning to make existing FWA licences tradable in the 3.6-4.2 GHz band by the end of 2004.
- 5.5.4 Although Indepen suggested new spectrum values for this band, Ofcom believes further analysis is needed on these values. However, currently it is untimely to review these given the changes that might be made to FWA, such as possible further releases of spectrum in this band. These developments could yield important information on the market for FWA which we will be able to take into account in reviewing the fee structure. It is therefore proposed to hold the fees for FWA licences in these bands at the current level.

Question 11

Do you agree with the proposals for fees for the non-auctioned broadband fixed wireless access to remain at current levels?

Section 6

Pricing proposals for PMSE

Current position and charging

6.1.1 Programme-Making & Special Events (PMSE) licenses are not currently charged on an AIP basis, but on a cost recovery basis. Licences are charged with the aim to ensure direct costs of managing this spectrum are met whilst also trying to reflect the amount of use. Consequently, there are a number of different factors used in setting fees within PMSE to cater for a variety of different user needs.

Indepen's recommendation

6.1.2 Indepen's recommendation for PMSE spectrum did not propose any significant change from the current methodology. However, the report did suggest the breakpoint at which fixed rather than mobile is used as the comparator service should be changed from 1GHz to 3GHz. In addition, Indepen suggested that where channels are assigned on an exclusive basis over a local, regional or national area, the same approach to fee determination be taken as for PBR services.

6.1.3 These recommended changes would result in a substantial fee increase where the spectrum could also be used for PBR services and is in a congested area. The example used in the Indepen report quoted a regional channel of 12.5 kHz bandwidth covering the whole of the London area in the 450 – 470 MHz band that would currently cost a PMSE user £180 per year. This fee would rise to £1,289 if Indepen's recommendations were applied.

Specific proposals for charging

6.1.4 Ofcom has carefully considered the recommendation that AIP should have some application for PMSE. However, as outlined in the Spectrum Trading Statement of August 2004, Ofcom is considering how PMSE bands should be managed longer term, so does not think it would be helpful to introduce AIP at the current time.

6.1.5 Although Ofcom does not plan to implement AIP in PMSE spectrum this year, Ofcom does intend to increase fees across the sector in the near future. In order to recover the full cost of providing and maintaining a high quality service for PMSE users, Ofcom proposes to increase fees by 20% (averaged across fee categories) from April 2005 and another 20% from April 2006 (averaged across fee categories). Those fees that are considerably out of step with market values (e.g. assignments for exclusive use) are subject to increases above the average figure. However, increases in fees for temporary use have on the whole been kept below the average level. This provides an option for many users to mitigate the increases. This is purely a cost recovery exercise as the cost of providing the service has exceeded the fees taken in recent years. These changes will remain in force until 2007 by which time it is expected that decisions will have been taken regarding the future management of this sector. This will include decisions on the introduction of spectrum trading and AIP.

- 6.1.6 See Annex 7 for an overview of Ofcom's pricing proposals to increase cost-based fees for the PMSE sector. The annex includes tables outlining the current and proposed new licence fees for the Occasional Use 'pay as you go' fee, the carnet system and for wireless microphones.

Question 12

Do you agree with the proposals for increasing PMSE fees to cover costs?

Section 7

Pricing proposals for other applications

7.1 Introduction

7.1.1 This section covers pricing proposals for the following other applications:

- Aeronautical and maritime communications
- Aeronautical and maritime radar
- 5.8 GHz wireless access
- Amateur and Citizens' Band Radio
- Government and emergency services
- Science and technology

7.2 Aeronautical and maritime communications

Current position and charging

7.2.1 Aeronautical and maritime communications services are not currently subject to AIP. AIP was not considered appropriate as these bands are allocated exclusively to these services on an international basis. It is not possible to charge foreign vessels for the use of the spectrum. In addition, aircraft and ships licences entitle access to all channels on a non-exclusive basis and do not provide an opportunity to "economise" on spectrum use.

7.2.2 Instead, licence fees are currently set on a notional cost recovery basis at levels that are significantly lower than the AIP levels applied to other, comparable services such as PBR. A summary table with current aeronautical and maritime licence products and fees can be found in Annex 8.

New products, trends and developments

7.2.3 The aviation community is increasingly concerned about future congestion within the existing bands – in particular within the VHF band (118 – 137 MHz) – as demand for additional aeronautical mobile spectrum has increased. Demand stems from the high and continuing growth in aviation traffic in recent years, combined with the emergence of new data communication requirements.

Indepen's recommendations for aeronautical

7.2.4 Indepen believes there is a good case for the application of AIP in this aeronautical sector to incentivise the adoption of narrow band technology by the aviation community. A new narrowband standard is available which reduces the radio bandwidth required for VHF aeronautical mobile communications from 25 kHz to 8.33 kHz. The international civil aviation regulatory bodies have already implemented a requirement for commercial aircraft flying above 24,500 feet to upgrade their on-board equipment to the new narrowband standard. Indepen is of the opinion that adoption of this new standard could result in a reduction of up to 50% in the spectrum used by each ground station – meaning much of the anticipated growth in spectrum demand can be accommodated in the existing allocation.

- 7.2.5 Marginal values for the VHF aeronautical mobile band are estimated based on the cost of upgrading to narrowband equipment. Due to considerable uncertainty concerning the estimated cost of ground stations, Indepen gives a wide range of values; from £468,000 to £1.65m per MHz.
- 7.2.6 Indepen made two specific recommendations:
- Apply AIP to each ground station in areas that are congested (such areas should be identified in conjunction with the CAA).
 - Consider introducing a two-tier pricing regime for aircraft radio licences; retaining the existing cost-based fee where 8.33 kHz equipment is deployed and applying a premium for other equipment (the premium should reflect the cost differential between narrow band and conventional equipment).

Indepen's recommendations for maritime

- 7.2.7 Indepen does not believe AIP should be applied in the maritime band, as communications uses are heavily constrained by the international status and use of the bands and the fact the spectrum is largely used for safety purposes.
- 7.2.8 One exception is maritime business radio (MBR- licensed as Coastal Station Radio (UK), which uses a UK only allocation in the CSR channels (157 – 163 MHz), and for which there may be congestion on parts of the south coast. This frequency range is shared with PBR (VHF high band), which will be subject to AIP in congested areas. In this instance AIP should be applied as the opportunity cost of the spectrum is non-zero and users could potentially modify their spectrum demand by using more spectrally efficient equipment or in some cases switching to public networks. Indepen recommends that the PBR AIP should be used for this application in congested areas, as maritime business communications use spectrum in a PBR band.

Reactions and developments following Indepen

- 7.2.9 In parallel to Indepen's work, Interconnect also conducted a study for Ofcom focussing on these two sectors. As a result, a report has been published on the Ofcom website which assesses the technical, regulatory and socio-economic constraints and feasibility of the implementation of more spectrally efficient radiocommunications techniques and technology within the aeronautical and maritime communities¹⁹. A number of recommendations from this report will need to be considered in association with AIP. For example there are recommendations for the reduction of bandwidths in aeronautical communications, such as promoting the migration to 8.33 kHz VHF channel spacing.

Specific proposals for charging

- 7.2.10 There are no plans for any changes to these fees in the immediate future. In the next few years, Ofcom will be considering the possibility of introducing AIP for these services as one of a number of options. Any proposals for the introduction of AIP would be subject to further consultation with

¹⁹ 'An Assessment of the Technical, Regulatory and Socio-Economic Constraints and Feasibility of the Implementation of more Spectrally Efficient Radiocommunications Techniques and Technology within the Aeronautical and Maritime Communities', Interconnect Communications Limited, June 2004

stakeholders including the Civil Aviation Authority (CAA) and the Maritime and Coastguard Agency (MCA).

- Aeronautical: At this stage, Ofcom would welcome views on whether aeronautical fees should remain at cost-recovery levels for the coming year and to what extent there is scope for making use of aeronautical radio more efficient in future.
- Maritime: One future consideration involves Indepen's suggestion that AIP should be applied to maritime business radio (CSR-UK) at the level of PBR, as the two services share the band. Ofcom agrees with this suggestion and will review maritime business radio prices in parallel with PBR wide area prices (see business radio, section 4). Ofcom would welcome views on whether the proposals in this consultation for introducing AIP for maritime business radio services would be appropriate.

7.2.11 In addition, Ofcom plans some changes within the structure of the maritime licence class: the 5-year Ship Fixed licence and CSR Fixed Platform licences are being withdrawn. Although it was envisaged at the time of introduction that these would prove popular licence categories, the focus has shifted away from licensing to deregulation.

7.2.12 Ofcom is reviewing plans on whether to consult later this year on a proposal to exempt all ship radio users, including ship portable users (maritime) and all classes of aircraft radio and aircraft transportable radio users (aeronautical) from the need to hold a WT Act licence. Ofcom does not believe it would be appropriate to make changes in licence fees to any aeronautical and maritime services until the outcome of this Review is decided.

7.2.13 It should be noted that the introduction of Earth station on Vessels and Aircraft Earth Stations in the Satellite networks class (see section 5), will have no impact on ships or aircraft fees.

Question 13

(a) Do you agree with the proposals to make no changes to fees for aeronautical and maritime communications?

(b) What is your view on the appropriateness of introducing AIP in the future to some services in this sector, such as maritime business radio?

7.3 Aeronautical & maritime radar

Current position and charging

7.3.1 Aeronautical and maritime radar is not currently subject to AIP. Instead, aeronautical radar is set on a notional cost recovery basis at £50, and Maritime Navigational Aids and Radar at £40 per base station per frequency. Historically, AIP was not considered appropriate as radar bands are internationally designated exclusively for this application and do not experience congestion. Therefore, opportunity cost for this spectrum was estimated to be negligible.

New products, trends and developments

7.3.2 Although most radar bands currently do not experience congestion, the Civil Aviation Authority (CAA) believes certain bands could suffer congestion in

the future due to emerging demand for new radio-navigation and communication services. This may also be the case in the maritime sector.

Indepen's recommendations

7.3.3 Indepen's recommendations regarding aeronautical primary radar also apply in the maritime case. Indepen observes that 'In principle there is a case for applying AIP to aeronautical radar services in bands which could potentially be used by other services facing problems of spectrum congestion, or to older systems whose emission characteristics have the potential to significantly constrain the use of adjacent bands by other services.' These two distinct reasons for applying AIP are discussed below.

Use of band for alternative congested services

Some of the spectrum currently used by aeronautical radars or radionavigation systems in the UK could be used for alternative uses. AIP could be applied to this spectrum to promote efficiency, as they can be used by other services, unlike bands that are exclusively allocated on an international basis.

The best example is channel 36 in the UHF TV band, which is used exclusively in the UK by aeronautical radars while the rest of Europe uses it for broadcasting. In this case, the marginal value of spectrum derived for TV broadcasters (of £0.5-1m/MHz) could be applied. Another example is 1350 –1365 MHz, where fixed links could potentially make more use of the band.

Limit out-of-band emissions that constrain use of adjacent bands

Indepen believes AIP could be applied to radars – even in exclusively allocated bands – to give incentives to limit the extent of out of band emissions that effectively deny spectrum use in adjacent bands.

A report provided by Interconnect Communications²⁰ observed that the latest generation of radars provides significant improvements in spectrum efficiency in terms of a reduction in the level of out-of-band and spurious emissions generated by high power primary radars – reducing the impact such radars can have on services in adjacent bands, rather than a significant reduction in the operational bandwidth of the radar.

Hence the application of AIP to radars needs to take account of the opportunity cost arising not only from the denial of spectrum in the band the radar operates in, but also in adjacent bands. Indepen believes further technical work is required before a base-line of acceptable out of band emissions can be established for all radars. Only once a base-line is established can the possibility of pricing be considered.

Reactions and developments following Indepen

7.3.4 The Interconnect Communications report contains a number of recommendations relating to radar which will need to be considered in association with AIP. For example, the possibility of moving aeronautical

²⁰ 'Report of an Investigation into the Characteristics, Operation and Protection Requirements of Civil Aeronautical and Civil Maritime Radar Systems', Interconnect Communications commissioned by the RA, October 2002

surface movement radars currently in the Ku band to the X band is suggested. Additionally a number of other spectrum reduction techniques such as possible reduction of spurious / out of band emissions for radars are suggested, and will need to be considered.

Specific proposals for charging

- 7.3.5 There are no plans for any changes to these products or fees in the immediate future. Shortly, Ofcom will be looking at the possibility of introducing AIP for ground-based radar as one of a number of options. Any proposals for the introduction of AIP would be subject to further consultation. Preliminary discussions will be held with the Civil Aviation Authority (CAA) and other key stakeholders such as the Maritime and Coastguard Agency. At this stage, Ofcom would welcome views on whether aeronautical and maritime radar fees should remain at cost-recovery levels for the coming year and on the extent to which there is scope for making use of aeronautical and maritime radar more efficient in future.

Question 14

(a) Do you agree with the proposals to make no changes to fees for aeronautical and maritime radar?

(b) To what extent do you believe there is scope for making use of aeronautical and maritime radar more efficient in future, through the introduction of AIP?

7.4 5.8 GHz wireless access

- 7.4.1 The 5.8GHz Band was opened to wireless access services early in 2004 in order to facilitate local high data rate services. A light licensing regime and fee structure is currently in place which was established under section 6 of the Wireless Telegraphy Act 1949 in order to enable the earliest possible access to the spectrum for potential users. Ofcom proposes to consolidate these fee arrangements within the 2005 Licence Charges Regulations.
- 7.4.2 The current fee regime is £1 for each registered terminal subject to a minimum fee of £50 per licence. This administrative based fee is levied annually in order to give an opportunity for Ofcom to validate information contained in its registration database and was set at a level designed to recover licensing costs but not be a barrier to use by the widest constituency of users.
- 7.4.3 Ofcom is not proposing any change to the current fees for 5.8GHz wireless access, rather it seeks only to consolidate the existing fee structure within the Licence Charges Regulations for 2005.

Question 15

Are you content for Ofcom to consolidate the 5.8 GHz wireless access fees within the Licence Charges Regulations for 2005?

7.5 Amateur and Citizens' Band Radio

- 7.5.1 Ofcom has no proposals for changing fees for Amateur licences this year. However, consideration is being given to deciding how far Citizens' Band radio may be exempted, in which case there would be no fee. This will be the subject of a separate consultation on exemption later in 2004. Please also refer to the consultation on community audio distribution systems

issued by Ofcom on 10 August outlining trials in the Citizens' Bands, which may lead to possible exemption.

7.6 Government and emergency services

- 7.6.1 Ofcom intends to continue the practice started previously by Government to charge Government services a comparative rate for the use of spectrum. Some services such as fire and ambulance already pay the fees prescribed for classes for private business radio.
- 7.6.2 A new fee arrangement this year is the "Airwave" network used by the Police and other emergency and security services. A licence is now granted directly to Airwave and the intention is for Airwave to pay national and regional fees. Ofcom is currently in discussion with the interested parties on the method of applying a price comparative to other mobile uses.
- 7.6.3 The police & fire frequencies will continue to be charged at the national rate. Ofcom is currently in discussions with the Home Office with regards to whether they will continue to fund this licence, or whether individual forces will be invoiced.
- 7.6.4 Ofcom has also been in negotiation with the Ministry of Defence. The MoD already pays a comparative rate for parts of the spectrum that are shared with civil usage. Agreement has now been reached to charge for a much wider range of spectrum to promote consistency with other spectrum users and encourage efficient spectrum use. This approach means that MoD will pay a considerably higher sum from April 2005.

7.7 Science and technology

Current position and charging

- 7.7.1 There are three licence classes within the science and technology sector (see table below), the fees for which are not subject to AIP. The licences are non-commercial and non-permanent allowing access across the radio spectrum for the purposes of research and development. They are subject to consent from existing licence holders in the bands requested and are issued on a first come, first served, non interference basis. Fees are set on a cost recovery basis and at a level which should not discourage innovation.

New products, trends and developments

- 7.7.2 Ofcom plans to abolish the "Unspecified Operational Radio Use" licence class. This follows last year's decision to exclude commercial use licences from this sector and to provide licensing arrangements within the appropriate business areas.
- 7.7.3 Ofcom is in the process of initiating a review of all Non-Operational Development licences (NODL) – formerly known as Test and Development Licences – including the processes and issue procedures. This may not be structured as a formal consultation but the views of stakeholders will nevertheless be sought.

Specific proposals for charging

- 7.7.4 Until abovementioned review of the NODL is completed, Ofcom will continue with current pricing arrangements for these licence classes – as summarised in exhibit 8.

Exhibit 8: Summary of Ofcom pricing proposals for science and technology

Licence Class	Fee	Proposal
Non-Operational Temporary Use	£50 per channel/ location /month	No change
Non-Operational Development	£50 per station/ location /year	No change
Unspecified Operational Radio Use	£100 per channel/ location /year	Abolish Licence Class

Question 16

Do you agree with the proposals for science and technology to maintain current pricing arrangements, at least until the NODL review is completed?

Section 8

Pricing proposals for broadcasting

8.1 Introduction

- 8.1.1 This section addresses issues in relation to the potential application of Administered Incentive Pricing (AIP) to broadcasting.
- 8.1.2 It should be emphasised that this section is rather different in character and purpose from the rest of the document. In relation to other types of spectrum use, this consultation discusses the case for amending charges for spectrum with effect from April 2005. But in relation to broadcasting, the timetable for AIP is longer term and more tentative: in particular, the Government has given a commitment that charging an incentive price for analogue television spectrum will not begin before April 2006 at the earliest, and will not apply to digital television spectrum before expiry of the current multiplex licences (likely to be sometime around 2010-2014). This section therefore focuses on longer term options, and seeks views on these as a prelude to further policy development.
- 8.1.3 Ofcom would expect to undertake a further detailed consultation before bringing forward any proposals for the application of AIP in broadcasting. Further consultation may therefore take place in 2005 or later.
- 8.1.4 It is also important to recognise that some, but not all, broadcasters already make implicit payments for access to scarce spectrum as part of their broadcasting licence fees. Ofcom accepts that it would not be fair to charge these broadcasters twice for the same spectrum. Ofcom has therefore developed proposals to ensure that this would not happen were AIP to be introduced in any of the ways outlined here.
- 8.1.5 Irrespective of the application of AIP, Ofcom intends to update the current cost-based fees for broadcasting use of spectrum from April 2006. Present fees were set by reference to the RA's costs prior to 1998, and bear no relation to current costs.
- 8.1.6 The rest of this section is structured as follows:
- Subsections 8.2 to 8.5 summarise the background to the current consultation as it relates to TV and radio broadcasting;
 - Subsections 8.6 and 8.7 introduce administered incentive pricing (AIP) and set out current estimates of the opportunity cost of spectrum for terrestrial TV services;
 - Subsections 8.8 through 8.10 deal with the specifics of how AIP might be applied to analogue TV broadcasting;
 - Subsection 8.11 discusses the possible application of AIP to radio (sound) broadcasting; and
 - Subsection 8.12 makes some initial proposals for changes to the licensing arrangements for broadcasting spectrum that will facilitate the return of spectrum during the digital switchover process.

8.2 The Cave Review

- 8.2.1 Section 1 of this consultation paper above summarises the legislative background to spectrum pricing, and the general approach that has been taken to its application since 1998. Most users of spectrum now pay AIP for the spectrum that they use: broadcasting is the most significant type of spectrum use to which AIP does not currently apply.
- 8.2.2 The Independent Review of Spectrum Management²¹ led by Professor Martin Cave, which reported in March 2002 (the 'Cave Review') made a number of specific recommendations in relation to the management of spectrum for broadcasting and the extension of AIP to the sector. These would have the effect of making broadcasting more like other sectors that use spectrum, and were intended to create stronger economic incentives for efficient spectrum use.
- 8.2.3 In particular, the Cave Review suggested (see recommendations 11.1 to 11.4) that:
- Market-based spectrum management tools should be applied to the broadcasting sector so that usage of spectrum by all broadcasters would be exposed to the full opportunity cost of spectrum use;
 - Broadcasters should be given the ability to lease spectrum to other uses and/or users, once they have met their public service broadcasting commitments and other obligations. Broadcasters leasing spectrum should be able to keep the resulting revenues;
 - Spectrum used for broadcasting should be valued and the valuations released into the public domain. From the overall valuation, a value for each national analogue channel and each digital multiplex should be derived, based upon relevant factors such as geographical coverage and bandwidth used; and
 - Spectrum pricing should be applied to all broadcasters. The timing of the introduction of spectrum pricing should take account of existing agreements between broadcasters and the Government, (including commercial broadcasting licence fees which encompass access to spectrum). It should also take into account the Government's commitment to promote and support the take-up of digital television.

8.3 The Government Response

- 8.3.1 The Government's Response to the Cave Review²² (the 'Government Response') broadly endorsed these recommendations, and provided general support for the extension of economic instruments to spectrum management in broadcasting, subject to certain safeguards.
- 8.3.2 In particular, the Government Response sets out a framework within which AIP should be applied to TV and Radio Broadcasting. The key elements of this were as follows (see paragraphs 8.12 to 8.35 of the Government Response):

²¹ 'Review of radio spectrum management', Professor Martin Cave for the DTI and Her Majesty's Treasury, March 2002

²² 'Government Response to the Review of Radio Spectrum Management', Department of Trade & Industry, Radiocommunications Agency and HM Treasury, October 2002

- The Government agreed that spectrum pricing should be applied to all broadcasters to promote efficient use of the spectrum. However, the Government stated that the timetable for the introduction of spectrum pricing would need to reflect a number of factors, including extant regulatory arrangements with broadcasters and the take-up of digital television;
- The key issue in relation to spectrum used for television was the migration to digital TV broadcasting, as this was critical to achieving greater efficiency in spectrum usage. AIP for analogue spectrum should therefore be implemented in a way that demonstrably provided an additional incentive for TV broadcasters to achieve switchover;
- Proposals for AIP on analogue TV spectrum should take account of the ability of TV broadcasters to meet their public service obligations, and avoid penalising them if there was a delay in achieving switchover due to a political decision;
- AIP for analogue TV spectrum should not begin before 2006 at the earliest. Proposals should be subject to consultation, and should set out transition arrangements from the current regime;
- The Government noted its commitment not to apply AIP to spectrum used for digital terrestrial television ('DTT') until expiry of the current 12 year multiplex licences²³. It should, however, be appropriate to introduce spectrum pricing for digital terrestrial spectrum thereafter; and
- Further work was required to consider the scope for applying spectrum pricing to sound broadcasting, given the constraints on spectrum use imposed by the regulatory framework in that sector.

8.3.3 This document takes forward the commitment to consult widely on the application of AIP to analogue TV broadcasting. It does not address issues in relation to digital terrestrial TV broadcasting given that these are longer-term in nature. Sound broadcasting is also discussed briefly.

8.4 Digital switchover and spectrum efficiency

8.4.1 Ofcom agrees with the Government Response that the key to achieving greater spectrum efficiency in broadcasting is the move from analogue to digital broadcasting. In television, DTT technology is approximately four times more efficient in its use of spectrum as traditional analogue technology: in other words, four times as many television channels (or other information, such as sound channels) can be conveyed using a given amount of spectrum²⁴. This gain in capacity offers many potential benefits:

- Wider choice for viewers, and more control for viewers over what they watch;
- Improvement in the functioning of the UK TV broadcasting market by easing the entry barriers to the launch of new TV channels;

²³ Expiry dates for the multiplex licences range from December 2009 for Digital 3 & 4, to May 2010 for multiplex A and October 2014 for multiplexes B, C and D.

²⁴ Efficiency is four to five times greater on a like for like basis (in terms of bit-rate). However, digital technology permits conveyance of a higher number of channels at lower bit-rates (8 to 12 times as many channels).

- Greater scope for innovation and competition amongst broadcasters, as spectrum ceases to be a bottleneck for gaining access to audiences;
 - The scope for more innovative services, as completing the switchover from analogue to digital broadcasting will release spectrum for services such as mobile television or other new technologies at the frontiers of broadcasting and telecommunications; and
 - Sharper quality pictures.
- 8.4.2 Digital switchover in television has been discussed at length in Ofcom's Digital Switchover report published in April 2004²⁵. In September 2003, the Government published a cost-benefit analysis of digital switchover that shows large potential benefits associated with more efficient use of the spectrum if analogue TV broadcasting is in time fully replaced by digital.²⁶
- 8.4.3 Digital radio also uses spectrum more efficiently than analogue radio. However digital radio is also generally at an earlier stage of development than digital television. Ofcom is currently conducting a review of digital radio following a request from the Secretary of State for Culture, Media and Sport.
- 8.4.4 Ofcom considers that the promotion of digital switchover in television, and of digital technologies more generally, is an important regulatory objective, consistent with its wider duties in relation to spectrum management under section 154 of the Communications Act. Digital technologies offer the prospect of more efficient use of the spectrum, the development of more innovative services and additional competition in relevant markets. Ofcom therefore considers that it remains appropriate, as set out in the Government Response, to consider how the application of AIP to television broadcasting can create appropriate incentives for more efficient spectrum use through digital broadcasting.

8.5 Developments since 2002

- 8.5.1 In its Response the Government said that it would carry out an economic study into spectrum pricing. This study was carried out by Indepen, Aegis and Warwick Business School, and published by Ofcom in February 2004 (see also section 1.2.9).²⁷ Since publication, Ofcom has continued to work on the methodology and valuations that were developed for spectrum pricing across all the sectors discussed in the report.
- 8.5.2 A number of other major policy reviews are currently under way, which are relevant to AIP in TV broadcasting to varying degrees. These include preparations for financial reviews of the licence terms of Channel 3, Channel 5 and Teletext licences; a review of Public Service TV Broadcasting; and preparations for issuing Digital Replacement Licences for commercial public service TV broadcasters. These activities have been taken fully into account in preparing the proposals in this document.

²⁵ 'Driving Digital Switchover', Ofcom, April 2004, www.ofcom.org.uk/research/dso_report

²⁶ 'Cost Benefit Analysis (CBA) of Digital Switchover', Government, September 2003, www.digitaltelevision.gov.uk/publications/pub_cost_ben_analysis.html

²⁷ 'An economic study to review spectrum pricing', Indepen, Aegis Systems and Warwick Business School, February 2004, www.ofcom.org.uk/research/industry_market_research/m_i_index/spectrum_research/independent_review/spectrum_pricing.pdf

8.6 Rationale and basis for AIP

- 8.6.1 The fundamental idea behind AIP is very simple: if users have to pay for spectrum then they will look for ways to economise on its use. In other words AIP creates the incentive to use spectrum efficiently. More particularly, if the price of spectrum reflects the value of that spectrum to other potential users – the so called “opportunity cost” of the spectrum – the current user will be encouraged to recognise the impact of its spectrum usage decisions on other parties and should make more socially beneficial decisions as a result.
- 8.6.2 But what is the right price? It is only useful to society to have spectrum released if it can be reassigned to another user who can make better use of it than the original user. The right price is therefore somewhere between the cost to the current user of releasing some spectrum, and the value to another user of having access to that released spectrum.
- 8.6.3 In practical terms this means that when setting AIP-based fees Ofcom has to assess what it would cost an existing user of spectrum to provide the same level of service as they do today but with less spectrum. It may also be necessary to consider how much less it would cost them to provide the same level of service as today if they had more spectrum.

8.7 Estimates of the opportunity cost of spectrum for terrestrial TV broadcasting

- 8.7.1 As part of their study for the RA, Indepen, Aegis and Warwick Business School made estimates of the opportunity cost of spectrum for analogue terrestrial TV broadcasting pre-switchover, and digital terrestrial TV broadcasting post-switchover. They concluded that the opportunity cost of spectrum for analogue terrestrial TV broadcasting pre-switchover was approximately £368 million per year in total (for the five main analogue TV channels). For digital terrestrial TV broadcasting post-switchover their estimate was £307 million per year in total for six digital multiplexes (or approximately £57 million per year per PSB multiplex²⁸). These estimates should be viewed as indicative only in the light of the number of simplifying assumptions that Indepen *et al* had to make. It should also be noted that these estimates were based on providing continuing service to only one TV set per household.
- 8.7.2 Subsequent to the publication of the Indepen study in February, Ofcom has continued to refine these analyses, in particular that for analogue terrestrial TV broadcasting. Ofcom now estimates the opportunity cost of spectrum for analogue terrestrial TV broadcasting to be approximately £330 million per year in total for all five main PSB channels, even after allowance is made for continuation of service to all TV receivers in each household. This equates very approximately to £70-75 million per year for each of BBC1, BBC2, ITV1 and Channel 4/S4C, and approximately £30-35 million per year for Five²⁹.
- 8.7.3 Further details of all these analyses can be found in Annex 9 of this consultation paper.

²⁸ It is expected that the PSB digital multiplexes will use more spectrum than other digital multiplexes in order to provide greater coverage.

²⁹ Five uses approximately half the amount of spectrum used by the other four main PSB channels, and is not as widely available as a result.

- 8.7.4 No specific analysis has yet been conducted on the opportunity cost of spectrum for Teletext television, TV RSLs or Self-Help TV. Once the approach for the main TV channels has been clarified, then it is likely that this same approach will be adopted for these other categories of user with adjustments based on their relative spectrum usage.

8.8 Application of AIP to analogue television spectrum

- 8.8.1 In their study, Indepen *et al* also considered whether external factors such as public service TV broadcasting obligations or wider social benefits should be reflected directly in spectrum prices, and concluded that this was not appropriate. They noted that markets are less distorted if input prices (e.g. those for spectrum) are the same for all buyers, with the production of particular outputs (such as public service broadcasting) being promoted by other means, and concluded that such an approach generates greater welfare than one that distorts input prices for certain buyers in order to promote public policy goals.
- 8.8.2 Similar considerations apply to a wide range of other spectrum uses that have a public policy dimension – including use by emergency services, and for defence and national security applications. All these other classes of spectrum user already pay fees for spectrum based on an opportunity cost valuation. Ofcom considers that in general the approach suggested by Indepen – of setting input prices to be the same for all buyers – is likely to be the better way forward, and less distorting.
- 8.8.3 Ofcom considers that the way in which AIP is introduced and applied to analogue television broadcasting needs to take account of the broader regulatory framework that applies to television. In particular, Ofcom is required by the Communications Act 2003 to offer Digital Replacement Licences (DRL) to each of the commercial public service TV broadcasters (PSBs) such that the licences can take effect by 29 December 2004. Ofcom has published a separate consultation on the terms of these DRLs. The DRL consultation proposes that each of the commercial PSBs should have a series of obligations allowing the achievement of digital switchover by a certain date in relation to its licence areas.
- 8.8.4 Subject to the outcome of the DRL consultation, Ofcom therefore envisages that each of the commercial PSBs will be subject to specific obligations in its DRL to provide a digital service in a coverage area that is the same as that provided by the licensee in the analogue licence previously held. The licensees will also be required to provide an analogue service until a date specified in the licence (the “relevant switchover date”). After the relevant switchover date, the licensee will no longer be permitted to broadcast using an analogue signal.
- 8.8.5 In parallel with preparations for issuing the DRLs, the Government has been in discussion with the BBC about activities that the BBC might be asked to undertake in order to facilitate switchover.
- 8.8.6 As discussed in more detail below, Ofcom considers that the existence of switchover-related obligations on the TV broadcasters should be taken into account in considering the way in which AIP might be applied to analogue television spectrum.

8.9 Options for future pricing of analogue television spectrum

8.9.1 Ofcom has identified a number of options for the future pricing of analogue television spectrum consistent with the commitments made in the Government Response and the statutory criteria for exercise of Ofcom's spectrum management functions. These options are discussed below, with an impact assessment of each. Irrespective of whether or not AIP is applied to analogue TV broadcasting spectrum, Ofcom intends to update cost-based fees to reflect the current costs of administration (see paragraphs 8.9.2 and 8.9.3 below). Ofcom also recognises that some of the TV broadcasters already make an implicit payment for their spectrum under their Broadcasting Act Licences. Ofcom accepts that it would not be fair to charge these broadcasters twice for the same spectrum. Ofcom has therefore developed proposals (see subsection 8.10 below) to ensure that such double charging could not arise.

Updating of cost-based fees

8.9.2 Current fees for broadcasting use of spectrum are set by reference to the costs incurred by the Radiocommunications Agency prior to 1998, and bear no relation to Ofcom's current costs. Ofcom has therefore started to consider what the relevant fees would be if they were to be set by reference to current costs. In so doing it considered the methodology set out in the consultation on fees published in July for licences under the Broadcasting Act and for Telecommunication Operators³⁰.

8.9.3 If the same approach were used for spectrum, for which the total annual costs of administration are around £85 million, it would appear that £7 million to £9 million should be attributed to broadcasting in total. This compares with a current sum received in WT Act fees for broadcasting of about £5 million. Spectrum fees would therefore need to be raised by about 50% to meet this shortfall. It is for further consideration how the costs should be divided between TV and radio. Ofcom proposes to consider these issues further before changing fees in 2006 to charge revised cost based fees for all instances where AIP is not applied.

Option 1: Do not introduce AIP for analogue TV broadcasting spectrum

8.9.4 Under this option the only alteration to fees would be to bring them into line with Ofcom's current costs of administration.

8.9.5 **Impact assessment.** This option would have little impact on existing analogue TV broadcasters, and would not encourage them to make any adjustment to their behaviour in relation to the use of spectrum. This approach would arguably have some advantages:

- there would be no need for the broadcasters to identify the resources required to make any significant additional payments for analogue spectrum; this would avoid any potential impact on broadcasters' ability to produce high quality content and so to meet their public service obligations.

8.9.6 However, Ofcom considers that this option would also have significant disadvantages:

- it would continue to treat television broadcasting in a different way from other sectors that are major users of spectrum;

³⁰ 'Principles for setting licence fees and administrative charges', Ofcom, July 2004, http://www.ofcom.org.uk/consultations/current/licence_admin_fees/

- no progress would be made in achieving greater consistency in the application of AIP to television broadcasting until 2010-2014 at the earliest; and
- AIP would not play any role in promoting greater efficiency in the use of television spectrum.

8.9.7 In light of these disadvantages, Ofcom does not consider that this option is attractive as the future means of pricing for TV broadcast spectrum.

Option 2: Introduce AIP from some date between 2006 and 2012

8.9.8 Under this option AIP would be introduced for analogue TV spectrum from some date between 2006 and 2012. A series of options have been identified for the date from which AIP would be applied.

Option 2a: Apply AIP in full to analogue TV spectrum from 2006

8.9.9 Under this option AIP would be applied in full to analogue TV broadcast spectrum from April 2006. This would be the earliest date for introduction consistent with the commitments given in the Government Response to Cave.

8.9.10 Under this option, Ofcom would expect to consult further on the detailed pricing proposals in 2005. Further quantitative analysis would be undertaken beforehand, in light of the responses to this consultation, and the final level of spectrum prices is therefore uncertain. However, it is likely that the full application of AIP in 2006 would lead to a significant increase in the payments currently made for relevant WT Act licences.

8.9.11 **Impact assessment.** The advantages of this option are that:

- it would create a strong economic incentive on spectrum users to make the most efficient use of the analogue spectrum; in practice, this should create a strong incentive to accelerate the transition from analogue to digital broadcasting;
- it would rapidly achieve consistency between the treatment of analogue television broadcasting and other major users of spectrum.

8.9.12 However, Ofcom sees a number of significant disadvantages with this approach. In particular:

- it would create additional regulatory uncertainty and impose significant unexpected costs on some analogue television broadcasters;
- these negative impacts could have a significant adverse effect on the ability of those broadcasters to provide high quality programming and innovative services;
- the rapid introduction of spectrum pricing in full would be inconsistent with the past treatment of other sectors; in the past, AIP has been introduced in a phased manner, allowing licensees time to adjust.

8.9.13 Ofcom also considers that the introduction of AIP in full from April 2006 may be disproportionate assuming the commercial PSBs are under direct obligations to create the conditions for switchover under the DRLs. Similar considerations apply to the BBC.

8.9.14 As discussed earlier, in Ofcom's judgment digital switchover is the most important means available in the next few years for achieving greater efficiency in the use of television spectrum. The DRLs – and similar commitments by the BBC – are likely to be the primary regulatory

instrument for ensuring that switchover takes place, and for specifying related obligations. Assuming this to be the case, Ofcom judges that it should not be necessary to impose AIP in full from April 2006 to promote greater spectrum efficiency in the sector.

8.9.15 Ofcom therefore judges option 2a to be unattractive.

Option 2b: Phased application of AIP to analogue spectrum in line with DSO plan

8.9.16 Under this option AIP would apply to analogue TV spectrum in each region from the date when digital switchover in that region is due to be completed. If a TV broadcaster continued to use analogue spectrum after this date for reasons within their control, it would need to make payments for using the analogue spectrum.

8.9.17 Ofcom expects that by the end of 2005 (at the latest) there will be a clearly specified timetable for the switch off of analogue TV broadcasting, on a region by region basis, over a period of four to five years (the 'DSO plan'). The DRLs as at the end of 2005 should therefore reflect the planned timetable for digital switchover, and in particular the planned dates for cessation of analogue terrestrial TV broadcasting.

8.9.18 Under this Option 2b, Ofcom would expect to bring forward Licence Charges Regulations, each year from 2006, which would include fees based on the opportunity cost of spectrum for those regions where analogue switch-off should have been achieved by that time, according to the timetable in the DRLs as at the end of 2005. Broadcasters who continued to hold analogue spectrum in the relevant regions, after the making of such Regulations, would therefore be liable for opportunity cost based fees. Ofcom would exercise its discretion in this regard, and in particular would not impose AIP where switchover had not been achieved for reasons outside the control of the broadcaster. A delay might, for example, occur following a decision by Government to delay switchover, However, broadcasters who chose to continue analogue broadcasting after the date for switchover embodied in their DRLs as at the end of 2005 for reasons within their control, would be liable to pay opportunity cost based fees.

8.9.19 **Impact assessment.** This option would have a number of advantages. In particular:

- it would reinforce the incentives for broadcasters to achieve digital switchover in line with the DSO plan, obligations in the DRLs, and any commitments made by the BBC to Government;
- in particular, it would mean that if broadcasters chose to continue analogue broadcasting after the switchover date in the DSO plan, they would have to recognise the opportunity cost of their actions;
- this option would avoid sudden adverse effects on the broadcasters, through increased regulatory uncertainty and significant additional costs; the broadcasters would not have any liability under AIP unless they continued to broadcast in analogue after the switchover date in the DSO plan (as reflected in the DRLs at the end of 2005);
- there would therefore be no negative impact on broadcasters' ability to fund high quality programming or innovative services, unless the broadcasters choose to continue broadcasting on analogue beyond the planned switchover date.

8.9.20 Ofcom has identified one disadvantage of this option:

- the treatment of broadcasting, relative to other sectors already subject to AIP, would continue to be different until the agreed dates for digital switchover have passed.

8.9.21 In this particular case Ofcom does not consider this disadvantage to be particularly material. Terrestrial broadcasting is already subject to more extensive and direct regulation in relation to spectrum usage (and other aspects of behaviour) than most other sectors using spectrum. This is reflected in the content of the Broadcasting Act licences for commercial PSBs, the BBC's Agreement with the Government, as well as the relevant WT Act licences. It is appropriate for Ofcom to take this wider regulatory environment into account in deciding on the approach to introducing AIP. This points towards a less aggressive approach to the introduction of AIP than might be applied in sectors with more discretion over their spectrum use. It is also relevant to note that, on the assumption digital switchover begins to be effected in 2007, AIP would begin to be applied to analogue spectrum in 2007 or 2008. This is only 1 or 2 years later than the earliest date in the Government Response to Cave.

8.9.22 Ofcom therefore judges that this Option 2b has merit.

Option 2c: Apply AIP in full to analogue TV spectrum from the date when switchover is due to be completed nationwide

8.9.23 A further option would be to wait until the date when DSO is due to have been completed across the whole country (currently anticipated to be 2012) before applying AIP to any continuing use of spectrum for analogue terrestrial television broadcasting.

8.9.24 **Impact Assessment.** Ofcom can see that, like Option 1, this option would arguably have some advantages:

- in common with Option 1 it would mean that we avoid any sudden adverse effects on the broadcasters, through increased regulatory uncertainty and significant additional costs; the broadcasters would not have any liability under AIP until 2012.

8.9.25 However, like Option 1, this option has a number of significant disadvantages:

- it provides little additional incentive on broadcasters to be efficient in their use of spectrum, and in particular to achieve digital switchover earlier than 2012; and
- it also maintains differentiation in the treatment of TV broadcast spectrum from all other users of spectrum for a long period of time.

8.9.26 Ofcom therefore judges Option 2c to be unattractive.

Conclusion

8.9.27 Ofcom's preliminary conclusion is therefore that Option 2b is the most attractive option that strikes the best balance between aligning AIP in television broadcasting with other sectors, creating an appropriate environment for promoting spectrum efficiency, and not impeding the achievement of digital switchover and the fulfilment of the broadcasters' PSB obligations.

8.10 Interaction with additional payments

- 8.10.1 Channel 3 and Channel 5 licensees, and the Teletext licensee, differ from other analogue television broadcasters in that they are liable to make Additional Payments for their Broadcasting Act licences. These already include an implicit payment for access to scarce analogue spectrum. It would plainly not be justifiable to charge these broadcasters twice for the same spectrum, and Ofcom has given a commitment that it will not do so. The following paragraphs discuss how this commitment would be discharged under options 2a, 2b or 2c.
- 8.10.2 The Additional Payments payable by the broadcasters comprise a mix of fixed cash sums, and payments assessed as a Percentage of Qualifying Revenue (PQR). The liability for Additional Payments is determined by Ofcom under periodic reviews of the financial terms for these licences. Each of these licensees will be offered a Digital Replacement Licence (DRL) later this year in accordance with the Communications Act 2003. The financial terms included in these DRLs will be the same as the financial terms in the licensees' present licences, which are primarily analogue licences. However, Ofcom has proposed that all Channel 3, Channel 5 and Teletext licensees should have the option to seek reviews of the financial terms in the Digital Replacement Licences from 31 December 2004.
- 8.10.3 It is important to note that the Additional Payments paid by these licensees implicitly include a payment reflecting the scarcity value of the analogue spectrum. This will be described in further detail in Ofcom's statement on the methodology for valuing licences in the forthcoming review of financial terms. In the report on Digital Switchover, Ofcom explicitly stated that it will not charge broadcasters twice for use of the same spectrum (see footnote 25). It is therefore important to consider two points:
- First, are there any circumstances in which a 'double payment' could arise if AIP applies to analogue spectrum?
 - Second, if there are, what mechanism can Ofcom use to ensure that no double payment is made?
- 8.10.4 As described above, Ofcom's preferred option for the application of AIP to analogue television broadcasting is that broadcasters should make payments under AIP if they continue to use the analogue spectrum after the date on which the spectrum should be released, as set out in the DRLs at the end of 2005.
- 8.10.5 Ofcom will also make assumptions about the date of digital switchover (and more widely, the timing of progress in digital take-up) in valuing each of the licences for which a licensee requests a financial review.
- 8.10.6 In principle, therefore, there are three dates in relation to digital switchover in a particular region that are relevant to the payments made by a licensee under Additional Payments and AIP:
- The date assumed in the valuation under a financial review of Additional Payments;
 - The date included as a licence obligation in the licensee's DRL as at the end of 2005; and
 - The date on which analogue broadcasting actually ceases.
- 8.10.7 Exhibit 9 describes how these dates might relate to one another in a number of illustrative scenarios, in order to identify whether a double

payment could indeed arise in any circumstances, and therefore whether a mechanism is required to ensure that this does not occur in practice.

Exhibit 9: Illustrative scenarios for digital switchover and AIP

Date for DSO assumed in licence valuation	Date for DSO included in DRL, as at the end of 2005	Date on which analogue broadcasting ceases	Broadcaster pays AIP?	Potential double payment?	Comment
2010	2010	2010	No	No	DSO implemented in line with DRL as at end of 2005
2010	2011	2011	No	No	DSO implemented in line with DRL as at end of 2005
2010	2011	2012	Yes, if reasons for delay are within control of broadcaster.	Potentially– if broadcaster is liable to make payments under PQR for revenues relating to analogue broadcasting between 2011-2012.	Implementation of DSO delayed beyond date embodied in DRL as at the end of 2005

8.10.8 The table shows one set of circumstances in which a double payment could potentially arise. This is when the broadcaster is liable to pay both AIP and PQR on analogue broadcasting revenue, after the scheduled date for analogue switch-off embodied in the relevant DRL as at the end of 2005, when the reasons for the delay to switchover are within the control of the broadcaster. Under these circumstances, unless an adjustment is made, the broadcaster could pay twice for the same spectrum.

8.10.9 The risk of double payment does not arise in the context of fixed cash sums, even though licensees may be liable for such payments at the same time as paying AIP. This is because such cash sums are fixed at the point of the financial review, and will reflect Ofcom's best estimate at that time of the date of DSO (among many other factors). If the date of DSO is subsequently altered no additional (or lesser) cash sum becomes due.

8.10.10 Ofcom considers that the appropriate mechanism for ensuring that there is no double payment in the scenario described above would be to deduct any payments made under AIP from a licensee's liability for PQR payments related to analogue revenue in the year in question, assessed on a region-by-region basis. Thus if a licensee were liable to pay £5 million in AIP for using analogue spectrum in 2011, but was also liable to make payments of £6 million in PQR in relation to revenue derived from analogue broadcasting after the due date for switchover, Ofcom would propose to reduce the liability for analogue PQR payments to £1 million. If by contrast the AIP

liability were £8 million, and the analogue PQR liability £6 million, no payment would be made for analogue PQR. In both cases the AIP payment would be due in full, as would any fixed cash sum payments.

- 8.10.11 If one of the options 2a, 2b or 2c is adopted, Ofcom would include a description of this mechanism in its revised Statement of Principles for the Definition of Qualifying and Multiplex Revenue in due course.³¹ Licensees may seek reviews of the financial terms of these licences 6 years following a previous determination. It is therefore possible that further reviews may be requested in 2011. Ofcom would expect to take account of the latest information then available on both digital penetration and potential payments under AIP when undertaking such reviews.
- 8.10.12 Ofcom considers that the mechanism described above would be consistent with implementing AIP for analogue television broadcasting in a non-discriminatory way across the sector, ensuring that each broadcaster faces an appropriate incentive to use spectrum efficiently.

TV Restricted Service Licences (RSL)

- 8.10.13 The fees for spectrum for TV Restricted Services Licences (RSL) are not currently included in the Fee Regulations. The current fees are £200 and these need to be included in the new Regulations. Ofcom will need to consider whether this fee adequately covers costs, and if not a change may need to be made in 2006.

8.11 Radio (Sound) Broadcasting

- 8.11.1 The Cave Review recommended that spectrum pricing also be applied to radio broadcasting in order to increase spectrum efficiency. Cave suggested that (see recommendation 11.41):
- BBC's analogue radio frequencies could have a charge based on opportunity cost from 2006 onwards;
 - Commercial analogue radio licensees could also be charged for spectrum after the expiry of their current Broadcasting Act licences;
 - New licensees could also be charged an explicit fee for the opportunity cost of their spectrum; and
 - The timing and level of prices for digital radio multiplexes would need to take into account the objective of encouraging the platform.
- 8.11.2 The Government Response to Cave agreed that users of sound broadcasting spectrum should face the same economic incentives to use their spectrum efficiently as other users and that market based spectrum management tools are the best way to create these incentives. But the Government recognised that the regulatory framework for commercial radio imposes tight constraints on the way in which sound broadcasters may use their spectrum and that further work would be needed to assess if there would in reality be scope to apply spectrum pricing to sound broadcasting.

³¹ The previous version of this statement is: 'Qualifying revenue and multiplex revenue: statement of principles and administrative arrangements', ITC, October 2001, http://www.ofcom.org.uk/codes_guidelines/broadcasting/tv/eco_reg_comp_pub/qualifying_rev/?a=87101

- 8.11.3 If it were found that there was no scope for the application of pricing, the Government suggested that sound broadcasters would only be subject to such charges as Ofcom requires to recover from licensees its administrative costs and that this would be applied to digital broadcasters as well as analogue broadcasters.
- 8.11.4 The Government said that if, however, incentive pricing is appropriate, it should be phased in over time.
- 8.11.5 The pricing of spectrum used for sound radio services was not addressed in the Indepen Report as methodological difficulties prevented the development of a suitable pricing model. Ofcom is not therefore bringing forward any proposals for AIP in the radio sector at this time. Ofcom will however continue to consider whether any changes to the WT Act Licence fees may be appropriate in future. Ofcom will bear two points in particular in mind:
- The need to ensure that the WT Act Licence fees at least recover Ofcom's relevant administrative costs from April 2006; and
 - The potential scope for spectrum pricing to play a role in encouraging greater spectrum efficiency, in particular, through analogue to digital migration; issues affecting radio in this respect are broadly analogous to television.
- 8.11.6 Any proposals for changes will of course be subject to consultation in advance of introduction.

Community Radio

- 8.11.7 The current Charges Regulations do not cover Community Radio, which is a new form of licensing. Ofcom proposes to charge the same fee structure as it uses for National and Local Radio services, which is based on population coverage. Fees in Medium wave range from £226 for coverage of less than 100,000 to £339 for each group of 100,000. In VHF the fees range from £339 to £509 for the same size groups.

8.12 Changes to licensing arrangements

- 8.12.1 Licences for the use of spectrum for analogue television broadcasting are presently held by ntl plc (for TV broadcasts by ITV, Channel 4 and Channel 5) and Crown Castle plc (for broadcasts by BBC). These licences also encompass other types of spectrum use, including for sound broadcasting.
- 8.12.2 Ofcom considers that the structure of the present licences is anomalous, in that the beneficial rights to spectrum use fall properly to the individual broadcasters but the spectrum licences are currently held by the providers of transmission. Ofcom intends to propose changes to the licence structure in due course, in advance of digital switchover, so that licences are held by broadcasters rather than transmission providers. The new structure of licences will also allow the spectrum released by digital switchover to be returned more readily to Ofcom as switchover is completed, region by region, across the UK. It is likely that the same process will be undertaken in respect of sound broadcasting.

Question 17

Do you have any comments to make on the Indepen and Ofcom estimates of the opportunity cost of spectrum for analogue and digital TV broadcasting?

Question 18

Do you agree with Ofcom's analysis of the advantages and disadvantages of each option for the future pricing of analogue TV spectrum?

Question 19

Are there any other options for the future pricing of analogue TV spectrum that you think Ofcom should consider?

Question 20

Do you agree with Ofcom's conclusion that Option 2b strikes the best balance between the different factors that Ofcom must take into account when setting future fees for analogue TV broadcasting spectrum?

Question 21

Do you agree with Ofcom's proposed approach to ensuring that no broadcaster is charged twice for the same analogue TV broadcasting spectrum?

Question 22

Do you have any comment to make on options for the future pricing of spectrum for radio (sound) broadcasting or proposals for extending current pricing?

Question 23

Do you agree with Ofcom's proposals to change the structure of spectrum licensing so that broadcasters rather than transmission providers hold these licences?

Section 9

Regulatory Impact Assessment (RIA)

- 9.1.1 The analysis presented in this section, when read in conjunction with the rest of this document, represents a Regulatory Impact Assessment (RIA), as defined by section 7 of the Communications Act 2003. RIAs provide a valuable way of assessing different options for regulation and showing why the preferred option was chosen. They form part of best practice policy-making and are commonly used by other regulators.
- 9.1.2 Section 7 of the Communications Act 2003 sets out that Ofcom has to carry out RIAs where our proposals would be likely to have a significant effect on businesses or the general public, or when there is a major change in Ofcom's activities. In accordance with this section, in producing the RIA in this document, Ofcom has had regard to such general guidance as it considers appropriate, including related Cabinet Office guidance. Comments on this RIA should be sent to Ofcom by the closing date for this consultation. We will consider all comments before deciding whether to implement our proposals as set out in this consultation document.

9.1 Risk assessment

The risks associated with the pricing proposals for each licence class, as described in sections 4-7, are outlined in exhibit 10 below. The mitigating factors which Ofcom believes will minimise the likelihood of these risks actually materialising are set out beside them.

Exhibit 10: Risk assessment of Ofcom pricing proposals

Mobile applications	Risk	Compensating factors
Public wireless networks (2G public mobile networks)	Potential efficiency gains are not achieved.	Uncertainty over the values of key inputs in the opportunity cost calculation over the next few years leads to a wide range of possible values for AIP fees. Setting AIP fees on today's information risks potentially disruptive swings in AIP levels in future years. Given this uncertainty, the costs of this disruption may exceed the efficiency gains that can be achieved. Ofcom can wait until it has sufficiently accurate information to set AIP fees and this may lead to greater economic efficiency in the longer term.
Business radio (PBR, PAMR, CBS, National Paging, 5.8GHz)	Potential efficiency gains are not achieved.	Ofcom can wait until conditions are more settled in the business radio and related public mobile sectors. This may avoid the disruption to the industry that seriously miscalculating AIP fees would cause in the current uncertain climate. The costs of this potential disruption may be greater than the efficiency gains which are sacrificed.
Fixed applications	Risk	Compensating factors
Point to point fixed links	AIP fee is overestimated discouraging investment.	Ofcom's methodology for applying AIP has been exposed to considerable external scrutiny through stakeholder consultations, on both the general opportunity cost and the application of the general cost to different fixed link licence classes.
Satellite	Greater efficiency may be foregone.	The fees will be reviewed in 2005 offering the chance to set AIP fees more accurately.
Fixed Wireless Access	Potential efficiency gains are not achieved.	Ofcom is intending to make additional spectrum available for FWA and the opportunity cost of this spectrum should become much clearer once this has happened.

PMSE	Risk	Compensating factors
Programme making & special events	The level of costs recovered may be excessive.	The costs of managing this spectrum can be precisely identified since Ofcom uses a contractor as band manager. Moreover the contract for managing the band was awarded through competitive tender and the best value for money bidder was selected.
Other applications	Risk	Compensating factors
Aeronautical and maritime communications	The VHF aeronautical communications band will become congested in near future.	Ofcom, together with CAA, is closely following developments in both new technologies and the demand for VHF spectrum. Ofcom has also carried out initial work on the scope for introducing AIP and other measures to improve spectrum efficiency. One option is to promote recognition of efficiency issues in international fora that may coordinate important future developments such as the introduction of digital and data communications in the VHF band.
Aeronautical and maritime radar	Civil and military organisations will have little incentive to improve efficiency.	Cooperation between Ofcom, CAA and MCA may be better at achieving efficiency improvements than pricing, because the long lead times for installing and replacing radar limits the scope for short term efficiency gains.

9.2 Cost and benefit assessment

The tables below set out the likely costs and benefits associated with two sets of options for setting charges for the each of the licence classes discussed in this document. Exhibit 11 concerns the first set of options, which incorporate Ofcom's preferred options for changing AIP and cost recovery charges (for some licence classes the proposal is actually for no change) as proposed in this document. Exhibit 12 concerns the second set of options, which describe other feasible alternatives for spectrum pricing. These alternative options are assessed to verify that Ofcom's proposals do generate the best outcome for the management of spectrum. Ofcom would incur administrative costs in implementing each change, but in each case these costs are expected to be small in comparison to the other costs and benefits.

Exhibit 11: Option 1 intended proposals for AIP and cost recovery charges

Mobile applications	Proposal	Costs	Benefits
Public wireless networks (2G public mobile networks)	Postpone updating of AIP fees to review in 3 years time.	Potential gains in economic efficiency are foregone, but there is little certainty at the moment on true opportunity cost.	Avoids potential fluctuations in AIP which would be disruptive to the cellular industry.
Business radio (PBR, PAMR, CBS, national paging, 5.8GHz)	Postpone updating of AIP fees to review in 3-5 years time.	Potential gains in economic efficiency are foregone. Any existing distortion in competition between business radio and cellular due to the inaccuracy of the current AIP charges is maintained.	Avoids further distorting competition between business radio and cellular, if cellular AIP fees are not changed.
Fixed applications	Proposal	Costs	Benefits
Point to point fixed links	Implement changes to AIP charges and formula.	The change in the AIP formula will require little additional information to be collected, therefore the cost of the change will be low.	The spectrum allocated to fixed links will be used more efficiently.
Satellite	<ul style="list-style-type: none"> a. increase minimum fee to cover costs b. extend differential pricing formula for network licence classes to new ESV and AES classes. 	Potential gains in economic efficiency foregone from updating AIP more widely.	<ul style="list-style-type: none"> a. covering costs will ensure good spectrum management b. a minor benefit arises from extending network licensing through the new classes for shipboard and aircraft earth stations.
Fixed Wireless Access	No change.	Potential gain in economic efficiency is foregone.	Disruption to the industry is avoided at a time of significant developments.

PMSE	Proposal	Costs	Benefits
Programme making & special events	Increase charge to cover costs - no plan to introduce AIP.	Where the value of the spectrum to other users is higher than for PMSE, potential increases in economic efficiency will be foregone. If there is no viable alternative demand for PMSE spectrum, given the constraints placed on its usage, the efficiency foregone will be small.	The current band manager can fulfil its duties properly when all their costs are covered. In future, SMOs might feel more secure if they are sure they can cover all their costs through pricing.
Other applications	Proposal	Costs	Benefits
Aeronautical and maritime communications	No change.	Potential gains in economic efficiency in aeronautical VHF band are foregone.	<ul style="list-style-type: none"> a. avoids disruption to an aviation industry recovering from external shocks. b. international maritime vessels will not be pressured to buy multi-purpose radios in order to operate in UK and other waters. c.
Aeronautical and maritime radar	No change.	The potential gain in economic efficiency foregone is limited because of international restrictions on use of spectrum.	Avoids reducing the safety of life element of radar services.

Exhibit 12: Option 2 alternative proposals for AIP

Mobile applications	Proposal	Costs	Benefits
Public wireless networks (2G public mobile networks)	Update AIP fee on the basis of current information.	Potential disruption to industry if AIP level is frequently adjusted because market developments over the next 3 years are difficult to predict.	Economic efficiency gains are not delayed, to the extent that AIP fee can be set accurately, given current uncertainty in the market.
Business radio (PBR, PAMR, CBS, national paging, 5.8GHz)	Update AIP fee on the basis of current information. Restructure and simplify licence classes to reflect liberalisation proposals.	Potential distortion in competition with public wireless networks due to difficulty in setting AIP fees accurately for business radio and related public mobile sectors.	Immediate gains in economic efficiency.
Fixed applications	Proposal	Costs	Benefits
Point to point fixed links	Maintain current AIP structure.	Potential efficiency gains from updating AIP would be foregone.	There is little uncertainty in the market therefore the benefit from minimising disruption to industry is low.
Satellite	Introduce AIP in shared bands, not in exclusive spectrum, as recommended by Indepen.	Introducing AIP now would not allow it to be coordinated with the introduction of Recognised Spectrum Access. This may create market distortions and further disruption for industry if AIP fees need to be changed as a result.	Potential immediate gains in economic efficiency.
Fixed Wireless Access	Base AIP fee on the auction prices for similar spectrum, e.g. 3.4GHz auction for FWA 3.6GHz spectrum.	May be seen as setting a precedent for how Ofcom will adjust AIP in relation to prices paid in auctions and so may distort bidding in future auctions.	If 3.4GHz auction bids represent a market evaluation of the opportunity cost of this spectrum, basing AIP on this will promote efficiency.

PMSE	Proposal	Costs	Benefits
Programme making & special events	Apply AIP to spectrum in demand from other services.	If there is no viable alternative for PMSE users, and charges rise sufficiently that some spectrum is returned, broadcasting output may be impaired. This may reduce the social benefits generated by broadcasting.	Where the value of the spectrum in other uses is higher than for PMSE, economic efficiency will increase.
Other applications	Proposal	Costs	Benefits
Aeronautical and maritime communications	Charge AIP fees on systems that are not spectrally efficient (aviation and CSR-UK maritime). No AIP for spectrally efficient systems given safety of life constraint.	Cost to industry of purchasing and fitting new devices, which is increased by the need to ensure safety-of-life equipment is not compromised.	May free up capacity in VHF spectrum for aeronautical, which is expected to be in high demand in future. The benefits will be limited to domestic aviation and maritime users only.
Aeronautical and maritime radar	Introduce AIP to promote the reduction of unwanted emissions.	Cost of developing methods to measure extent of out-of-band emissions.	Interference to users in bands adjacent to radars will be reduced.

Business radio

For business radio three supplementary pricing alternatives need to be assessed, see exhibit 13. These alternatives relate to inconsistencies of treatment across different licence classes within the overall business radio category, due to the use of two adjustment factors in calculating existing AIP charges: the “choice and diversity” factor and “step-in” arrangements (see section 4).

Exhibit 13: intended proposals for AIP and cost recovery charges for business radio

	Proposal	Costs	Benefits
Business radio preferred option	Phase out the adjustment factors* over 2 years from 2005-06.	Some companies may face minor disruption to their business plan, though phasing in changes over two years should give time to adjust.	The market distortion is removed and the potential for inefficient entry into the business radio market is reduced, though the full effect is delayed until 2006.
Business radio alternative 1	Withdraw the adjustment factors* in 2005.	Companies which had not anticipated that the adjustment factors would be withdrawn could face disruption to their business plans in the short term.	The market distortion is removed immediately and the potential for inefficient entry into the business radio market is reduced.
Business radio alternative 2	Retain the adjustment factors indefinitely.	Private business radio markets are distorted unnecessarily. Trading and liberalisation of spectrum will lower entry barriers in private business radio and facilitate greater choice and diversity for users. The adjustment factors will become an unnecessary subsidy.	Companies already receiving subsidised spectrum because of the adjustment factors would not face short term disruption to their business plans from a sudden increase in their fees for spectrum.

* Those licensees already receiving the “step-in” arrangement would continue to receive for the remaining duration of the 5-year term.

9.3 Broadcasting preliminary RIA

This preliminary RIA outlines the options for broadcasting, as identified in section 8. These options concern not firm proposals, but rather longer term options for further policy development. To highlight the different nature of these options, they are set out in a separate, preliminary, RIA. Exhibit 14 outlines the risk assessment, and exhibit 15 the benefit and cost assessment for broadcasting.

Exhibit 14: Broadcasting risk assessment

Broadcasting applications	Risk	Compensating factors
Broadcasting - analogue TV	Incentives for the efficient use of analogue spectrum are slow to be introduced.	Transition to digital terrestrial broadcasting will have the greatest impact on the efficient use of the TV broadcasting spectrum as a whole. As long as the application of AIP to TV broadcasting promotes this objective, the impact on incentives for efficient use of the analogue spectrum (in isolation from the entire TV broadcasting spectrum) is less of a concern.
Broadcasting - analogue radio	Potential efficiency gains are not achieved.	The review of spectrum pricing was unable to value the opportunity cost of radio broadcasting, therefore further work is needed. The only current information on licence value comes from takeovers of radio stations and values fluctuate considerably. Estimating AIP fees on this basis could potentially be very inaccurate and harm efficiency.

Exhibit 15: Broadcasting benefit and cost assessment

	Proposal	Costs	Benefits
Broadcasting - analogue TV preferred option 2b	Phase introduction of AIP in line with digital switchover, i.e. if the switchover timetable is not met region by region.	The ability to increase economic efficiency, other than by digital switchover, is limited. Therefore, little is lost by not charging AIP fees in full immediately.	The incentives for digital switchover are reinforced which will release substantial spectrum for new services. It avoids the disruption of applying full AIP fees at once.
Broadcasting - analogue TV, alternative 1	Bring current fees (i.e. existing cost recovery charges set in 1997) into line with Ofcom's current cost of administration.	Broadcasting as a whole will not face incentives for maximising economic efficiency in its use of analogue spectrum nor for becoming more efficient in a dynamic sense by switching to digital broadcasting.	No funding is diverted from programme making or switchover preparations. The actual costs of managing the spectrum are fully met encouraging efficient administration of the spectrum. No disruption to current business plans.

	Proposal	Costs	Benefits
Broadcasting - analogue TV, alternative 2a	Apply full AIP fees for analogue spectrum from 2006.	Additional regulatory uncertainty may impose costs. These and the significant unexpected costs of full AIP could disrupt public sector broadcasting and programme making commitments.	The incentive to improve efficiency in planning analogue TV spectrum as a whole would be very effective. In practice, this would in turn create a strong incentive to switch to digital.
Broadcasting - analogue TV, alternative 2c	Apply AIP in full from date when digital switchover is completed nationally (currently assumed 2012).	Potential efficiency gains up to 2012 are foregone, particularly because there would be little incentive to achieve digital switchover in any region earlier than 2012.	There is be no disruption through a sudden unforeseen increase in costs and broadcasters have an incentive to achieve switchover, but not earlier than 2012.
Broadcasting - analogue radio preferred option	Keep fees on cost recovery basis.	Potential gains in economic efficiency are foregone, but the ability to capture them would be limited by the difficulty in setting AIP fees accurately.	Avoids inaccuracy, and potential market distortions that would follow from setting AIP fees on information which is currently severely limited.
Broadcasting - analogue radio alternative	Introduce AIP.	Market would be distorted if lack of information led to significant inaccuracies in setting AIP fees. There could be social costs if no broadcaster wanted to cover less popular local areas.	Economic efficiency would increase to the extent that AIP fees were set accurately.

9.4 Conclusions

- 9.4.1 Ofcom believes that the benefits of its preferred approach to spectrum pricing, as described under Option 1 above, outweigh the costs. The net benefits of Option 1 also appear to be greater than those of the alternative options considered. The costs and benefits of the changes proposed are difficult to quantify, because there is little evidence on how much efficiency could be improved by changing existing allocations and assignments of spectrum. However, our qualitative analysis gives good reason to expect that the benefits are likely to be significantly larger than the costs, to spectrum users and the UK economy.
- 9.4.2 The alternatives considered fall into two groups, either maintaining cost recovery charging, or risking the setting of new AIP charges where there is considerable uncertainty in the market. Ofcom's preferred course of action is to strike a balance between the desire to get more value out of spectrum, and the desire to avoid introducing large inaccuracies into AIP, in order to minimise the risk of seriously disrupting markets.
- 9.4.3 Ofcom believes that where there is clear evidence that spectrum is congested or there is a demand for spectrum from alternative types of use, cost recovery is not appropriate, because the potential loss in economic efficiency is likely to be large. Certainly, both Ofcom's and the EU's evaluation of the impact of spectrum trading show that substantial economic benefits can be gained by improving the current allocation of spectrum. On the other hand, where market uncertainty is high, the disruptive impact of changes in the level of AIP which may sub-sequentially have to be reversed, also has to be considered. Ofcom therefore believes it is more prudent and more effective in the long term to delay revising AIP until there is greater stability and certainty over key inputs to AIP calculations in such cases.

Section 10

Responding to this consultation

How to respond

Ofcom invites written views and comments on the issues raised in this document, to be made by **5pm on the 3rd of December**.

Ofcom strongly prefers to receive responses as e-mail attachments, in Microsoft Word format, as this helps us to process the responses quickly and efficiently. We would also be grateful if you could assist us by completing a response cover sheet (see Annex 2), among other things to indicate whether or not there are confidentiality issues. The cover sheet can be downloaded from the 'Consultations' section of our website.

Please can you send your response to spectrumpricing@ofcom.org.uk.

Responses may alternatively be posted or faxed to the address below, marked with the title of the consultation.

Spectrum Markets Team
Floor 4A
Ofcom
Riverside House
2A Southwark Bridge Road
London SE1 9HA

Fax: 020 7783 4103 (marked "Spectrum pricing consultation")

Note that we do not need a hard copy in addition to an electronic version. Also note that Ofcom will not routinely acknowledge receipt of responses.

It would be helpful if your response could include direct answers to the consultation questions asked in this document, which are listed together at Annex 3. It would also help if you can explain why you hold your views, and how Ofcom's proposals would impact on you.

Further information

If you want to discuss the issues and questions raised in this consultation, or need advice on the appropriate form of response, please contact Marloes van Caspel on 020 7783 4418 or 020 7783 4313.

Confidentiality

Ofcom thinks it is important for everyone interested in an issue to see the views expressed by consultation respondents. We will therefore usually publish all responses on our website, www.ofcom.org.uk, ideally on receipt (when respondents confirm on their response cover sheet that this is acceptable).

All comments will be treated as non-confidential unless respondents specify that part or all of the response is confidential and should not be disclosed. Please place any confidential parts of a response in a separate annex, so that non-confidential parts may be published along with the respondent's identity.

Ofcom reserves its power to disclose certain confidential information where this is necessary to fulfil its functions, although in practice it would do so only in limited circumstances.

Please also note that copyright and all other intellectual property in responses will be assumed to be assigned to Ofcom unless specifically retained.

Next steps

Following the end of the consultation period, Ofcom intends to publish a statement together with draft pricing Regulations in early January 2005 for appropriate licence classes. After a one-month statutory consultation on these draft Regulations, Ofcom plans to finalise the pricing Regulations, to take effect on April 1st 2005.

Please note that you can register to get automatic notifications of when Ofcom documents are published, at http://www.ofcom.org.uk/static/subscribe/select_list.htm.

Ofcom's consultation processes

Ofcom is keen to make responding to consultations easy, and has published some consultation principles (see Annex 1) which it seeks to follow, including on the length of consultations.

If you have any comments or suggestions on how Ofcom conducts its consultations, please call our consultation helpdesk on 020 7981 3003 or e-mail us at consult@ofcom.org.uk. We would particularly welcome thoughts on how Ofcom could more effectively seek the views of those groups or individuals, such as small businesses or particular types of residential consumers, whose views are less likely to be obtained in a formal consultation.

If you would like to discuss these issues, or Ofcom's consultation processes more generally, you can alternatively contact Philip Rutnam, Partner, Competition and Strategic Resources, who is Ofcom's consultation champion:

Philip Rutnam
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Riverside House
2A Southwark Bridge Road
London SE1 9HA
Tel: 020 7981 3585
Fax: 020 7981 3333
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Annex 1

Ofcom's consultation principles

Ofcom has published the following seven principles that it will follow for each public written consultation:

Before the consultation

1. Where possible, we will hold informal talks with people and organisations before announcing a big consultation to find out whether we are thinking in the right direction. If we do not have enough time to do this, we will hold an open meeting to explain our proposals shortly after announcing the consultation.

During the consultation

2. We will be clear about who we are consulting, why, on what questions and for how long.
3. We will make the consultation document as short and simple as possible with a summary of no more than two pages. We will try to make it as easy as possible to give us a written response. If the consultation is complicated, we may provide a shortened version for smaller organisations or individuals who would otherwise not be able to spare the time to share their views.
4. We will normally allow ten weeks for responses, other than on dispute resolution.
5. There will be a person within Ofcom who will be in charge of making sure we follow our own guidelines and reach out to the largest number of people and organisations interested in the outcome of our decisions. This individual (who we call the consultation champion) will also be the main person to contact with views on the way we run our consultations.
6. If we are not able to follow one of these principles, we will explain why. This may be because a particular issue is urgent. If we need to reduce the amount of time we have set aside for a consultation, we will let those concerned know beforehand that this is a 'red flag consultation' which needs their urgent attention.

After the consultation

7. We will look at each response carefully and with an open mind. We will give reasons for our decisions and will give an account of how the views of those concerned helped shape those decisions.

Annex 2

Consultation response cover sheet

- A2.1 In the interests of transparency, we will publish all consultation responses in full on our website, www.ofcom.org.uk, unless a respondent specifies that all or part of their response is confidential. We will also refer to the contents of a response when explaining our decision, unless we are asked not to.
- A2.2 We have produced a cover sheet for responses (see below) and would be very grateful if you could send one with your response. This will speed up our processing of responses, and help to maintain confidentiality by allowing you to state very clearly what you don't want to be published. We will keep your completed cover sheets confidential.
- A2.3 The quality of consultation can be enhanced by publishing responses before the consultation period closes. In particular, this can help those individuals and organisations with limited resources or familiarity with the issues to respond in a more informed way. Therefore Ofcom would encourage respondents to confirm on the response cover sheet that Ofcom can publish their responses upon receipt.
- A2.4 We strongly prefer to receive responses in the form of a Microsoft Word attachment to an email. Our website therefore includes an electronic copy of this cover sheet, which you can download from the 'Consultations' section of our website.
- A2.5 Please put any confidential parts of your response in a separate annex to your response, so that they are clearly identified. This can include information such as your personal background and experience. If you want your name, contact details, or job title to remain confidential, please provide them in your cover sheet only so that we don't have to edit your response.

Cover sheet for response to an Ofcom consultation

BASIC DETAILS

Consultation title:

To (Ofcom contact):

Name of respondent:

Representing (self or organisation/s):

Address (if not received by email):

CONFIDENTIALITY

What do you want Ofcom to keep confidential?

Nothing

Name/contact details/
job title

Whole response

Organisation

Part of the response

If there is no separate annex, which parts?

If you want part of your response, your name or your organisation to be confidential, can Ofcom still publish a reference to the contents of your response (including, for any confidential parts, a general summary that does not disclose the specific information or enable you to be identified)?

Yes

No

DECLARATION

I confirm that the correspondence supplied with this cover sheet is a formal consultation response. It can be published in full on Ofcom's website, unless otherwise specified on this cover sheet, and all intellectual property rights in the response vest with Ofcom. If I have sent my response by email, Ofcom can disregard any standard email text about not disclosing email contents and attachments.

Ofcom can publish my response: on receipt once the consultation ends

Name

Signed (if hard copy)

Annex 3

Consultation questions

Question 1

Do you have any views about payment dates other than the licence anniversary?

Question 2

Do you have any comments on the threshold for permitting spread payments?

Question 3

Do you agree that fees for partitioned licences be apportioned by population, frequency or time proportion in the units exemplified?

Question 4

Do you agree with the proposal for public wireless networks to maintain the current fees?

Question 5

Do you support Ofcom's proposal to abolish the "choice and diversity" factor and the "step-in" arrangements in the business radio sector over 2 years (as in option 1)?

Question 6

Do you support this long-term phased approach for simplifying business radio sector licences?

Question 7

Do you agree with the proposals for not changing scanning telemetry fees?

Question 8

Do you agree with the proposed algorithm for the point to point fixed links sector?

Question 9

(a) Do you agree with the proposals to make no changes to licence fees for satellite services – except an increase in the minimum fee to cover costs?

(b) Do you agree with the proposed fees for the new licence classes within satellite services?

Question 10

Do you agree with the proposal for point to point security CCTV services to not make any fee changes?

Question 11

Do you agree with the proposals for the non-auctioned broadband fixed wireless access to remain at current levels?

Question 12

Do you agree with the proposals for increasing PMSE fees to cover costs?

Question 13

(a) Do you agree with the proposals to make no changes to fees for aeronautical and maritime communications?

(b) What is your view on the appropriateness of introducing AIP in the future to some services in this sector, such as maritime business radio?

Question 14

(a) Do you agree with the proposals to make no changes to fees for aeronautical and maritime radar?

(b) To what extent do you believe there is scope for making use of aeronautical and maritime radar more efficient in future, through the introduction of AIP?

Question 15

Are you content for Ofcom to consolidate the 5.8 GHz wireless access fees within the Licence Charges Regulations for 2005?

Question 16

Do you agree with the proposals for Science and Technology to maintain current pricing arrangements, at least until the NODL review is completed?

Question 17

Do you have any comments to make on the Indepen and Ofcom estimates of the opportunity cost of spectrum for analogue and TV broadcasting?

Question 18

Do you agree with Ofcom's analysis of the advantages and disadvantages of each option for the future pricing of analogue TV spectrum?

Question 19

Are there any other options for the future pricing of analogue TV spectrum that you think Ofcom should consider?

Question 20

Do you agree with Ofcom's conclusion that Option 2b strikes the best balance between the different factors that Ofcom must take into account when setting future fees for analogue TV broadcasting spectrum?

Question 21

Do you agree with Ofcom's proposed approach to ensuring that no broadcaster is charged twice for the same analogue TV broadcasting spectrum?

Question 22

Do you have any comment to make on options for the future pricing of spectrum for radio (sound) broadcasting?

Question 23

Do you agree with Ofcom's proposals to change the structure of spectrum licensing so that broadcasters rather than transmission providers hold these licences?

Annex 4

Fixed links algorithm

A2.6 The proposed fixed links fees algorithm:

Fixed link licence fee =	$Spectrum\ Price \times Band\ Width\ Factor \times Band\ Factor \times Path\ Length\ Factor \times Availability\ Factor \times Antenna\ Factor \times Sharing\ Factor$
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A2.7 An explanation of each of the elements in this formula is given in the following paragraphs.

Spectrum Price

A2.8 The Spectrum Price replaces the previous £925 reference fee which came from the Smith-Nera report³² produced during the original spectrum pricing work carried out in 1998-99. The reference fee (from which all others were effectively derived) was developed for a hypothetical 2 x 28MHz bandwidth fixed link based on the Smith-Nera valuation of the available fixed links spectrum at the time using the “least cost alternative” methodology.

A2.9 The Spectrum Price is developed from the recent Indepen Report which recommended £132 per 2 x 1MHz as an appropriate price. However, in developing its algorithm proposals Ofcom established that the methodology used by Indepen to determine this Spectrum Price was highly sensitive to the number and types of link used. The Indepen work included links utilising the more popular link data rates and bandwidths, but these only cover some 27,000 links out a total installed base of almost 40,000. In addition, Indepen interpolated a number of equipment prices which were then factored into the calculation.

A2.10 Due to the sensitivity of the Indepen methodology, Ofcom developed its own estimate of an appropriate Spectrum Price, by including all utilised link data rates and bandwidth possibilities together with more realistic estimates of typical equipment costs. This produced a Spectrum Price of approximately £99 per 2 x 1 MHz of link bandwidth – Ofcom proposes using this new Spectrum Price in the algorithm.

Band Width Factor

A2.11 As most point to point links operate bi-directionally with equal data rates on the “go” and “return” legs, the bandwidth factor is simply the bandwidth of either the “go” or the “return” half of the link in MHz. For example, a 2 x 28MHz bi-directional link would have a Band Width Factor of 28.

A2.12 Uni-directional links are rare and effectively occupy half the bandwidth of the equivalent bi-directional links, hence it might be expected that the Band Width Factor used for these would be 50% of the equivalent bi-directional value. However, because the unused “go” or “return” leg may be difficult, or even impossible to assign to another user (as it can only be used by another uni-directional link in the opposite direction over the exact same path), it is

³² “The Economic Impact of the use of Radio in the UK” prepared by NERA and Smith Engineering Ltd for the Radiocommunications Agency and Oftel.

proposed to continue the current arrangement of a 25% reduction – i.e.: the Band Width Factor would be 75% of the equivalent bi-directional link value.

Band Factor

A2.13 The Spectrum Price values the whole of the spectrum available to fixed links taking account of utilised bandwidth and achieved/achievable data throughput rates. It does not however take account of the nature of radio propagation which limits the length of a fixed link as the frequency increases. For this reason, the lower fixed links frequencies are used more frequently for longer links and the higher fixed links frequencies are used for shorter links. Use of the lower frequencies for longer links limits their capacity for re-use and affects the degree of interference they may cause to other links. A Band Factor is therefore implemented to adjust the licence fee to reflect the degree of re-use possible and the potential to cause interference in the licensee's chosen band; the higher the frequency band, the lower the value of the Band Factor as detailed in the table below.

Band (GHz)	<i>Band Factor</i>
1.4	1.0
2	1.0
4	1.0
L6, U6	0.83
7.5	0.74
11	0.48
13, 14, 15	0.43
18	0.37
22, 23	0.35
25, 26, 28, 31, 32	0.3
38	0.26
50, 52, 55	0.17

A2.14 It might at first be thought the Band Factor for the 1.4GHz and 2 GHz bands should be higher than shown above. However, these bands are not what might be called "typical" fixed link bands since they have very limited spectrum available and so have to be restricted to low data rate, narrow bandwidth links. For this reason it is proposed that the Band Factor for these two bands will be the same as for the lowest "real" fixed links 4GHz band, at least in the first implementation of the algorithm.

A2.15 In its earlier proposals RA set the Band Factor for the newly released 18GHz band the same as that for the 13, 14 and 15GHz bands (the 18GHz band was previously the exclusive domain of a single major operator which has now been made available for mixed bathing assignments). However, further study of the band's radio propagation and interference characteristics has prompted Ofcom to suggest a Band Factor somewhere between that for the 13, 14 and 15GHz bands and the 22 and 23GHz bands.

Path Length Factor

A2.16 Ofcom (like the RA before it) operates a minimum path length (MPL) policy to conserve lower frequency bands for longer links which can be accommodated only in these bands. Whilst it will be Ofcom's general policy to avoid making assignments where the link path length is less than the MPL, it will do so when requested. When such assignments are made, the Path Length Factor

adjusts the fee accordingly – and places a premium on the use of path lengths below MPL.

A2.17 The MPL varies according to the frequency band and system type. The values for each band are listed in the table below.

Frequency (GHz)	Lower data rates	Higher data rates
	Minimum Path Length (km)	Minimum Path Length (km)
1.4	No min path length (< 2 Mbit/s)	30 (≥ 2 Mbit/s)
2	No min path length (< 2 Mbit/s)	30 (≥ 2 Mbit/s)
4	24.5	16
L6/U6	N/A	16
7.5	15.5	9.5
11	10	6
13/14/15	9.5	5.5
17/18	4	2.5
22/23	4	2
25/26	3	2
28	3	2
31	None*	None*
32	2	1.5
38	1	1
50/52/55	None	None

* The 31 GHz band is used exclusively for point-to-point security closed circuit television links. As the cameras have to be placed where they are required, no minimum link length is applied.

A2.18 Given the MPL for each band and system type, the Path Link Factor may be calculated according to the following formula:

• if; $PL \geq MPL$, Path Length Factor = 1	When a link path length is at least as long as the minimum path length, the Path Length Factor is equal to 1.
• if; $PL < MPL$, Path Length Factor = $SQRT(MPL/PL)$	When a link path length is less than the minimum path length, the Path Length Factor equals the square root of the minimum path length divided by the path length.

A2.19 The square root function (SQRT) has been included to reduce the unintended excessive effects of this factor at path lengths significantly less than the MPL. Radio wave attenuation with distance follows an inverse square law which means as the distance increases, the power level decreases by the inverse square of the change in distance. As the factor applies a distance factor related to power, the reverse of a square – a square root – was considered the most appropriate. In its responses, industry's suggested solution to the unintended excessive effects was a sloped straight line but, on investigation, Ofcom was of the view that this was too benign at very short link lengths, in contrast to Ofcom's original factor being too harsh. Use of the square root enables the factor to be non-linear (so it has an increasing effect as links get much shorter than the MPL) yet remain simple (Ofcom's objective was for the curve to intersect with industry's suggested straight line at around 30% of the MPL so that Ofcom's new factor was softer down to lengths of 30% MPL, but harsher thereon).

For example an operator may have many 7.5GHz band links (MPL = 15km) and for commonality of spares may wish to operate another with a very short path length of 1km. Previously the Path length Factor would have been 15/1 = 15 whereas under the revised proposals it would be $SQRT(15/1) = 3.87$.

Availability Factor

A2.20 A system availability requirement of 99.99% (sometimes referred to as “four nines” or “two nines”) is the normal starting point when making assignments and is the most commonly requested value. However, availability requirements up to 99.999% and down to 99.9% are also requested to suit customer needs. In developing the algorithm, the value of unity for the Availability Factor has been associated with the most common availability requirement – with higher and lower values attracting a higher or lower Availability Factor as detailed below.

Availability Requirement	Availability factor
99.999%	1.4
99.99%	1.0
99.9%	0.7
other availability requirement values will be interpolated/extrapolated	

Antenna Factor

A2.21 To encourage operators to use high performance antennas, an Antenna Factor has been developed to adjust the licence fee according to the bore-sight performance of the antenna used – as compared with the average bore-sight performance of all the antennas used within that band. Although side-lobe performance is also important, using a simple ratio of bore-sight gain figures is considered an adequate measure of the spectrum efficiency performance of the antenna.

Antenna Factor = $\frac{\text{Average Bore-sight Gain of all antennas used within the band}}{\text{Actual Bore-sight Gain of antenna used}}$

A2.22 This ratio will be calculated for each end of a link and the two results will be multiplied together. The following table shows the average Bore-sight Gain values for antennas in the bands listed.

Band (GHz)	Average Antenna bore-sight gain (dBi)	Band (GHz)	Average Antenna bore-sight gain (dBi)
1.4	18.5	15	42
2	44.5	18	34.8
4	40.1	22	39
6L & 6U	42	23	39.2
7.5	39.6	25	39.9
11	47.4	31	36
13	37.6	38	39.2
14	38.4	50	39.5

Sharing Factor

A2.23 In the earlier algorithm proposals, a congestion modifier was suggested which increased the fee at nodes (or sites) where more than a certain percentage of the available spectrum had been assigned. Establishing what that percentage figure should be proved difficult and was probably the most disputed figure within the whole algorithm proposal. On a fixed links site, it is not unusual for all/most of the links to be pointing in the same two or three azimuth directions along the main infrastructure routes (trunk routes), with none or the odd one pointing in other directions. This means that only in certain azimuth directions could the site be considered congested whilst in the remaining azimuth directions it clearly is not congested.

A2.24 In addition, if a higher fee is imposed where congestion is deemed to exist, then that has the unfortunate effect of discouraging further links to/from the site; i.e., it discourages site sharing, which is neither environmentally friendly nor spectrum efficient.

A2.25 To reflect this, a completely new approach – a Sharing Factor - is proposed which reduces the fee when more than a single link at a site* shares the same spectrum. 'Sharing spectrum' means using the same channel, or part thereof, within the same frequency band and polarisation.

* It is anticipated that a 'site' (the location of one or more antennas and/or antenna towers) will normally be the area contained within the normal Hi-Lo distance defined by the Technical Frequency Assignment Criteria for the band concerned.

A2.26 Normally the Sharing Factor is equal to 1, but where such sharing takes place the Sharing Factor equals 0.5 for each link sharing the spectrum – meaning a 50% discount on the fixed link spectrum fee.

A2.27 This discount will apply where different operators share on a site or where a single operator shares with themselves on a site. The Sharing Factor of 0.5 will be applied when either end of a link meets the above sharing criteria. This means that where an operator has a single link on a site and another operator can be assigned the same channel, BOTH will benefit from the application of the Sharing Factor of 0.5. Additional operators sharing the same channel at the same site also benefit from the Sharing factor of 0.5.

Annex 5

Financial impact of fixed links proposal

Effect of Fee Proposals

A5.1 Applying the proposed algorithm to virtually all of the currently assigned links across the fixed link bands results in the following estimates of fixed links fee income:

Potential Gross Anticipated Fixed link income	£27,250k (before applying Sharing factor)
Sharing factor element (separated out)	£3,000k
Potential Net Anticipated Fixed link income	£24,250k
<i>Net fixed link income in 2003-04</i>	<i>£19,500k</i>

Example fees for a selection of 'typical' links

A5.2 The following table shows example fees applying the proposed algorithm, assuming that the Antenna Factor, the Availability Factor, the Path Length Factor, and the Sharing Factor are equal to 1; and, in order to demonstrate that the algorithm generates fees below the proposed Minimum Fee, are calculated prior to the application of the £150 Minimum Fee.

Band (GHz)	Channel bandwidth (in MHz)							
	3.5	7	14	28	56	90		
4			£1,386	£2,772				£8,910
6L			£1,145	£2,290				£7,360
7.5	£256	£512	£1,024	£2,049	£4,098			
13	£151	£301	£603	£1,205	£2,410			
15	£151	£301	£603	£1,205	£2,410			
18	£128	£256	£513	£1,026	£2,051			
23	£121	£241	£482	£964	£1,928			
25	£105	£211	£422	£844	£1,687			
38	£90	£181	£362	£723	£1,446			

Annex 6

Satellite algorithm

Current pricing levels with proposals for increases

A6.1 The table below summarises the proposed increase in fee levels for satellite licence classes.

Licence class	Current fee approach	Proposed fee approach
Permanent Earth Station	Permanent Earth Station algorithm, minimum fee of £175	Unchanged algorithm, minimum fee of £500
Transportable Earth Station	Transportable Earth Station algorithm	Unchanged algorithm
Network	Network algorithm	Unchanged algorithm
Aircraft Earth station Network Operators licence	-	Application of network algorithm
Earth Station on board a vessel	-	Application of network algorithm

Approach for Aeronautical Earth Station (AES) and Earth Stations on board a vessel (ESV)

A6.2 The Network algorithm will apply to both the Aeronautical Earth Station (AES) and Earth Stations on board a vessel (ESV) licence classes. In this algorithm, the licence fee is defined as the vector sum of the transmit and receive elements.

$$AF = \sqrt{433.4 \times 50 \times P \times BW \times MOD}$$

A6.3 In the above algorithm;

- *AF* is annual licence fee
- *P* is the transmit peak power appearing at the flange of the network terminal antennas (in Watts);
- *BW* is the network transmit assigned bandwidth (in MHz);
- *MOD* is the modifier value as specified in Statutory Instrument 2001 No. 2265 (for the cases under consideration, this is 0.5) The modifiers are used to capture aspects of satellite operation that might affect the spectrum access denied to other users and include elevation angle, height, location screening and multiple satellite clearances at a single earth station. A further modifier is applied depending on whether the band in question is shared with fixed links or not.
- The *constant factor* is derived from the calculation of a reference fee for fixed satellite services (FSS) access to spectrum. The reference fee for access to 575MHz at a transmit power of 1000W is calculated from the fixed link price in a congested area for an unidirectional 28MHz bandwidth STM-1 multiplied by the ratio bandwidth available for a permanent earth station to that for the fixed link.

- A6.4 The annual fee for the Earth Station can be calculated based on one Nominated Point (NP) (i.e. $K=1$) and minimum fifty terminals (i.e. $N=50$) irrespectively from where the terminals operate.
- A6.5 This algorithm only applies in cases where the network operator can transmit from as many airports (i.e. nominated points) as required, provided that the total number of terminals is less than N .

Example calculation

- A6.6 For a typical AES network; $BW=32.4MHz$, $MOD=0.5$ and the P can be found based on the EIRP and the maximum antenna gain.

$$EIRP = 20dBW / 40kHz \Leftrightarrow EIRP=49dBW/32.4MHz.$$

$$\text{Max antenna gain } G_{max} = 34dBi$$

$$\text{Therefore, } P = EIRP - G_{max} = 15dBW \Leftrightarrow P = 31.6 W.$$

Based on the above numbers the annual fee for the CBB is given by:

$$AF = \text{sqrt}(433.4 \times 50 \times 31.6 \times 32.4 \times 0.5) = \text{£}3,330$$

- A6.7 For further information concerning this algorithm, see Spectrum Pricing third stage update and consultation, Radio Communications Agency, February 2001.

Annex 7

PMSE fees

Current pricing regime

A7.1 The table below gives an overview of the current PMSE fees, as shown in the Charges Regulations SI 2002 No 1700 and amended by SI 2003 No 2983.

Class of licence	The prescribed sum in respect of the issue or renewal of the licence and in respect of the prescribed time	The prescribed time: Interval of time for payment
<p>Programme Making and Special Events Fixed Site</p>	<p>For the issue of a licence, in a premium case, £55 plus the following supplemental sum:</p> <p>For the single channel talk-back or radio microphone for specific sites - £20 per channel per site</p> <p>For multi-channel talk-back or radio microphone, or wideband channel for specific sites - £80 per multi-channel or wideband channel per site</p> <p>For the variation of a licence, in a premium case, £55 plus the following supplemental sum:</p> <p>For the variation of a licence by adding an occasional use channel or a restricted service programme sound link channel, the sum payable on issue in respect of such channel, and for any other variation of a licence, such sum as represents one-twelfth of the supplemental sum payable for the issue of a licence for the type of channel to which the additional channel belongs multiplied by the number of complete and part-complete calendar months from the addition of the channel to the next anniversary of the issue of the licence</p> <p>Provided that for a variation of a licence where the aggregate sum payable would otherwise be less than £20, a transaction charge</p>	<p>None, save in relation to the sum which is to be paid upon the variation of a licence, where the prescribed time is the time of such variation</p>
<p>Programme Making and Special Events Link</p>	<p>For the issue of a licence, in a premium case, £55 plus the following supplemental sum:</p> <p>In any case other than a premium case, where the aggregate sum payable on the issue of a licence would otherwise be less than £20, a transaction charge, plus -</p> <p>For occasional use:</p> <ul style="list-style-type: none"> • £2 per channel of 12.5 kHz in the band 26-65 MHz • £6 per channel of 12.5 kHz in the band 65-470 MHz • £2 per channel of 12.5 kHz in the band 470-1,000 MHz • £12 per channel (not being a telemetry or telecommand channel) of 0.5 MHz in the band 1-2 GHz 	<p>None, save in relation to the sum which is to be paid upon the variation of a licence, where the prescribed time is the time of such variation</p>

	<ul style="list-style-type: none"> • £12 per telemetry or telecommand channel of 5 MHz in the band 1-2 GHz • £20 per channel of 5 MHz in the band 2-5 GHz • £12 per channel of 5 MHz in the band 5-8 GHz • £6 per channel of 5 MHz in the band 8-20 GHz • £4 per channel of 5 MHz in the band 20-40 GHz • £2 per channel of 5 MHz in the band above 40 GHz 	
	<p>For multi use type (1) channels:</p> <ul style="list-style-type: none"> • £108 per channel of 12.5 kHz in the band 26-65 MHz • £324 per channel of 12.5 kHz in the band 65-470 MHz • £108 per channel of 12.5 kHz in the band 470-1,000 MHz • £648 per channel of 0.5 MHz in the band 1-2 GHz • £1,080 per channel of 5 MHz in the band 2-5 GHz • £648 per channel of 5 MHz in the band 5-8 GHz • £324 per channel of 5 MHz in the band 8-20 GHz • £216 per channel of 5 MHz in the band 20-40 GHz • £108 per channel of 5 MHz in the band above 40 GHz <p>For multi use type (2) channels:</p> <ul style="list-style-type: none"> • £672 per channel of 12.5 kHz in the band 26-65 MHz • £2,016 per channel of 12.5 kHz in the band 65-470 MHz • £672 per channel of 12.5 kHz in the band 470-1,000 MHz • £4,032 per channel of 0.5 MHz in the band 1-2 GHz • £6,720 per channel of 5 MHz in the band 2-5 GHz • £4,032 per channel of 5 MHz in the band 5-8 GHz • £2,016 per channel of 5 MHz in the band 8-20 GHz • £1,344 per channel of 5 MHz in the band 20-40 GHz • £672 per channel of 5 MHz in the band above 40 GHz <p>For primary regional channels:</p> <ul style="list-style-type: none"> • £60 per channel of 12.5 kHz in the band 26-65 MHz • £180 per channel of 12.5 kHz in the band 65-470 MHz • £60 per channel of 12.5 kHz in the band 470-1,000 MHz • £360 per channel of 0.5 MHz in the band 1-2 GHz • £600 per channel of 5 MHz in the band 2-5 GHz • £360 per channel of 5 MHz in the band 5-8 GHz • £180 per channel of 5 MHz in the band 8-20 GHz • £120 per channel of 5 MHz in the band 20-40 GHz • £60 per channel of 5 MHz in the band above 40 GHz 	<p>None, save in relation to the sum which is to be paid upon the variation of a licence, where the prescribed time is the time of such variation</p>
	<p>For secondary regional channels and primary area channels:</p> <ul style="list-style-type: none"> • £24 per channel of 12.5 kHz in the band 26-65 MHz • £72 per channel of 12.5 kHz in the band 65-470 MHz • £24 per channel of 12.5 kHz in the band 470-1,000 MHz • £144 per channel of 0.5 MHz in the band 1-2 GHz • £240 per channel of 5 MHz in the band 2-5 GHz • £144 per channel of 5 MHz in the band 5-8 GHz • £72 per channel of 5 MHz in the band 8-20 GHz • £48 per channel of 5 MHz in the band 20-40 GHz • £24 per channel of 5 MHz in the band above 40 GHz 	<p>None, save in relation to the sum which is to be paid upon the variation of a licence, where the prescribed time is the time of such variation</p>
	<p>For programme sound link use:</p>	<p>None, save in</p>

	<p>£36 per channel of 12.5 kHz in the band 26-65 MHz</p> <p>For restricted service programme sound link use:</p> <ul style="list-style-type: none"> • £10 per channel of 12.5 kHz in the band 26-65 MHz • £30 per channel of 12.5 kHz in the band 65-470 MHz • £10 per channel of 12.5 kHz in the band 470-1,000 MHz • £95 per channel of 0.5 MHz in the band 1517-1525 MHz <p>For the variation of a licence, in a premium case, £55 plus the following supplemental sum:</p> <p>For the variation of a licence by adding an occasional use channel, restricted service programme sound link channel, multi use type (1) channel or a multi use type (2) channel, the sum payable on issue in respect of such channel, and for any other variation of a licence, such sum as represents one-twelfth of the supplemental sum payable for the issue of a licence for the type of channel to which the additional channel belongs multiplied by the number of complete and part-complete calendar months from the addition of the channel to the next anniversary of the issue of the licence</p> <p>Provided that for a variation of a licence where the aggregate sum payable would otherwise be less than £20, a transaction charge</p>	<p>relation to the sum which is to be paid upon the variation of a licence, where the prescribed time is the time of such variation</p>
<p>Programme Making and Special Events Low Power</p>	<p>For the issue of a licence, in a premium case, £55 plus the following supplemental sum:</p> <p>In any case other than a premium case, where the aggregate sum payable on the issue of a licence would otherwise be less than £20, a transaction charge, plus -</p> <p>For a single channel radio microphone -</p> <ul style="list-style-type: none"> • £8 per occasional use channel • £432 per multi use type (1) channel • £2,688 per multi use type (2) channel • £960 per primary UK channel • £240 per primary regional channel • £96 per primary area channel • £384 per secondary UK channel • £96 per secondary regional channel • £48 per secondary area channel <p>Multi-channel radio microphone, or single wideband channel -</p> <ul style="list-style-type: none"> • £40 per occasional use multi-channel or wideband channel • £2,160 per multi-use type (1) channel • £13,440 per multi-use type (2) channel 	<p>None, Save in relation to the sum which is to be paid upon the variation of a licence, where the prescribed time is the time of such variation</p>
	<p>For the variation of a licence, in a premium case, £55 plus the following supplemental sum:</p> <p>For the variation of a licence by adding an occasional use channel, multi-use type(1) channel or a multi-use type(2) channel, the sum payable on issue in respect of such channel, and for any other variation of a licence, such sum</p>	<p>None, save in relation to the sum which is to be paid upon the variation of a licence,</p>

	as represents one-twelfth of the supplemental sum payable for the issue of a licence for the type of channel to which the additional channel belongs multiplied by the number of complete and part-complete calendar months from the addition of the channel to the next anniversary of the issue of the licence Provided that for a variation of a licence where the aggregate sum payable would otherwise be less than £20, a transaction charge	where the prescribed time is the time of such variation
UK Wireless Microphone (Annual)	£75 per shared UK Multi-channel or wideband channel	Yearly
UK Wireless Microphone (Biennial)	£135 per shared UK Multi-channel or wideband channel	Two-yearly

Occasional Use “pay as you go” fee

A7.2 The 'pay as you go' fee is calculated by multiplying the fee per bandwidth with the number of bandwidth units required and the number of 48 hours periods. The table below indicates both the current charges for the Occasional Use 'pay as you go' fee, as well as the proposed changes in these fees for 2005 and 2006.

Frequency Range	Bandwidth Unit	Current 48hr Charge/ Bandwidth Unit	Proposed 48hr Charge/Bandwidth Unit April 2005	Proposed 48hr Charge/Bandwidth Unit April 2006
26 – 65 MHz	12.5kHz	£2	£2.25	£2.50
65 – 470 MHz	12.5kHz	£6	£7.00	£8.00
470 – 1000 MHz	12.5kHz	£2	£2.25	£2.50*
1 – 2 GHz	0.5 MHz	£12	£14.00	£16.00
2 – 5 GHz	5 MHz	£20	£23.00	£26.00**
5 – 8 GHz	5 MHz	£12	£14.00	£16.00
8 – 20 GHz	5 MHz	£6	£7.00	£8.00
20 – 40 GHz	5 MHz	£4	£4.50	£5.00
> 40 GHz	5 MHz	£2	£2.25	£2.00

Note: Fee = fee per bandwidth unit x number of bandwidth units required x number of 48hr periods

Low Power - Occasional Use (Pay as you Go)

Type	Current 48hr Charge	Proposed 48hr Charge/Bandwidth Unit April 2005	Proposed 48hr Charge/Bandwidth Unit April 2006
Single Channel	£8	£8.00	£10.00
Multi-Channel or Single wideband channel	£40	£48.00	£60.00

PMSE Fixed Site

Type	Current Annual Charge	Proposed Annual Charge April 2005	Proposed Annual Charge April 2006
Single Channel	£20	£24.00	£30.00
Multi-Channel or Single wideband channel	£80	£96.00	£120.00

PMSE Low Power – Primary and Secondary Radiomicrophone

Type	Current Annual Charge	Proposed Annual Charge April 2005	Proposed Annual Charge April 2006
Primary UK Channel	£960	£1152	£1382
Secondary UK Channel	£384	£460	£552
Primary Regional Channel	£240	£288	£345
Primary Area or Secondary Regional Channel	£96	£115	£138

PMSE Link - Primary Regional

Frequency Range	Bandwidth Unit	Current Annual Charge/ Bandwidth Unit	Proposed Annual Charge/ Bandwidth Unit April 2005	Proposed Annual Charge/ Bandwidth Unit April 2006
26 - 65 MHz	12.5kHz	£60	£72	£86
65 - 470 MHz	12.5kHz	£180	£225	£281
470 - 1000 MHz	12.5kHz	£60	£72	£86
1 - 2 GHz	0.5MHz	£360	£432	£518
2 - 5 GHz	5MHz	£600	£750	£937
5 - 8 GHz	5MHz	£360	£432	£518
8 - 20 GHz	5MHz	£180	£216	£258
20 - 40 GHz	5MHz	£120	£144	£172
> 40 GHz	5MHz	£60	£72	£86

PMSE Link - Primary Area and Secondary Regional

Frequency Range	Bandwidth Unit	Current Annual Charge/ Bandwidth Unit	Proposed Annual Charge/ Bandwidth Unit April 2005	Proposed Annual Charge/ Bandwidth Unit April 2006
26 - 65 MHz	12.5kHz	£24	£29	£34
65 - 470 MHz	12.5kHz	£72	£90	£112
470 - 1000 MHz	12.5kHz	£24	£29	£34
1 - 2 GHz	0.5MHz	£144	£172	£206
2 - 5 GHz	5MHz	£240	£300	£375
5 - 8 GHz	5MHz	£144	£172	£206
8 - 20 GHz	5MHz	£72	£86	£103
20 - 40 GHz	5MHz	£48	£58	£68
> 40 GHz	5MHz	£24	£29	£34

Carnet system

A7.3 The tables below indicate both the current charges for the Carnet system, as well as the proposed changes in these fees for 2005 and 2006.

A7.4 The underlying fees for multi-use type 1 and 2 'Carnets' are to be increased directly in line with Occasional Use fees. However, it is also proposed that the discounts gained under the 'Carnet' pre-payment scheme for temporary assignments will be reduced from April 2005 to 7.5% for type 1 (60 tokens) and to 25% for type 2 (480 tokens). It is intended to implement a further reduction of discount from April 2006 to 5% for type 1 and 20% for type 2.

Carnet system – multi use type (1) – 60 tokens

Frequency Range	Bandwidth Unit	60 Tokens(type 1)/ Bandwidth Unit	Proposed 60 Tokens(type 1)/ Bandwidth Unit charge 2005	Proposed 60 Tokens(type 1)/ Bandwidth Unit charge 2006
26 - 65 MHz	12.5kHz	£108	£125	£142
65 - 470 MHz	12.5kHz	£324	£388	£456
470 - 1000 MHz	12.5kHz	£108	£125	£142
1 - 2 GHz	0.5 MHz	£648	£777	£912
2 - 5 GHz	5 MHz	£1080	£1276	£1482
5 - 8 GHz	5 MHz	£648	£777	£912
8 - 20 GHz	5 MHz	£324	£388	£456
20 - 40 GHz	5 MHz	£216	£249	£285
> 40 GHz	5 MHz	£108	£125	£142
Low Power				
Radio mic (10mW)		£432	£444	£570
Multi channel radiomic or single wideband		£2160	£2664	£3192

Carnet system – multi use type (2) – 480 tokens

Frequency Range	Bandwidth Unit	480 Tokens (type 2)/ Bandwidth Unit	Proposed 480 Tokens (type 2)/ Bandwidth Unit charge 2005	Proposed 480 Tokens (type 2)/ Bandwidth Unit charge 2006
26 – 65 MHz	12.5kHz	£672	£810	£960
65 – 470 MHz	12.5kHz	£2016	£2520	£3072
470 – 1000 MHz	12.5kHz	£672	£810	£960
1 – 2 GHz	0.5 MHz	£4032	£5040	£6144
2 – 5 GHz	5 MHz	£6720	£8280	£9984
5 – 8 GHz	5 MHz	£4032	£5040	£6144
8 – 20 GHz	5 MHz	£2016	£2520	£3072
20 – 40 GHz	5 MHz	£1344	£1620	£1920
> 40 GHz	5 MHz	£672	£810	£960
Low Power				
Radio mic (10mW)		£2688	£2880	£3840
Multi channel radiomic or single wideband		£13440	Withdrawn*	Not available*

* To be withdrawn from April 2005. Multi-channel radiomic use can be more flexibly catered for by use of multiple single channel tokens.

A7.5 It is proposed that the transaction charge will apply where the total cost for frequency assignments is less than £24 (currently £20). The premium charge for licences or schedules issued out of office hours will remain at £55.

Wireless microphones

A7.6 The tables below indicate both the current charges for wireless microphones, as well as the proposed changes in these fees for 2005 and 2006.

Licence	Current Cost	Proposed Cost 2005	Proposed Cost 2006
UK Wireless Microphone (Annual)	£75 Yearly	£80 Yearly	£85 Yearly
UK Wireless Microphone (Biennial)	£135 Two yearly	£145 Two yearly	£155 Two yearly

UK Wireless Microphones (on-line)

Licence	Current Cost	Proposed Cost 2005	Proposed Cost 2006
UK Wireless Microphone (Annual)	Not available	£75 Yearly	£80 Yearly
UK Wireless Microphone (Biennial)	Not available	£135 Two yearly	£145 Two yearly

Note: This is a new licence category for on-line purchases only.

Programme Sound Links

Frequency Range	Bandwidth Unit	Current annual charge/bandwidth unit	Proposed Annual Charge/ Bandwidth Unit April 2005	Proposed Annual Charge/ Bandwidth Unit April 2006
26 - 65 MHz	12.5kHz	£36	£43	£51
1517 -1525 MHz	0.5MHz	£195	£205	£246

Restricted Service Programme Sound Links

Frequency Range	Bandwidth Unit	Current charge/bandwidth unit for 30days	Proposed Annual Charge/ Bandwidth Unit for 30 days April 2005	Proposed Annual Charge/ Bandwidth Unit for 30days April 2006
26 - 65 MHz	12.5kHz	£10	£12	£14
65 – 470 MHz	12.5kHz	£30	£36	£42
470 – 1000 MHz	12.5kHz	£10	£12	£14
1517- 1525 MHz	0.5MHz	£95	£100	£120

Annex 8

Aeronautical and maritime fees

Current aeronautical licence products and fees

Aeronautical Product	Fee
Aeronautical Ground Station (Air traffic/Ground Movement Control)	£150
Aeronautical Ground Station (Air to ground and flight information service)	£100
Aeronautical Ground Station (Operations Control)	£250
Aeronautical Ground Station (General Aviation)	£25
Aeronautical Ground Station (Fire)	£25
Aeronautical Ground Station (High Frequency)	£350
Aeronautical Ground Station (Offshore Platform)	£250
Aeronautical Radar	£50
Aeronautical Navigation Aid	£50
Aircraft with an approved maximum take-off weight of not more than 3,200 kg	£20
Aircraft with an approved maximum take-off weight of more than 3,200 kg but not more than 14,000 kg, provided that in the case of an aircraft which has recorded not more than 100 flying hours in each of the two years immediately preceding the issue of the licence	£150
Aircraft with an approved maximum take-off weight of more than 14,000 kg, provided that in the case of an aircraft which has recorded not more than 100 flying hours in each of the two years immediately preceding the issue of the licence	£350
Aircraft Transportable	£15

Current maritime licence products and fees

Maritime Product	Fee
Coastal Station Radio (Marina)	£75 per base
Coastal Station Radio (UK)	£180 per base per frequency
Coastal Station Radio (International)	£100 per base per frequency
Coastal Station Radio (Training School)	£50
Coastal Station Radio (Fixed Platform)*	£250
Navigational Aids and Radar	£40 per base per frequency
Differential Global Positioning System (VHF)	£250 per base per frequency
Differential Global Positioning System (MF/HF)	£1000 per base per frequency
Maritime Radio (Suppliers and Demonstration)	£50
Ship	£20
Ship Portable	£15
Commercial 5-year Ship Fixed *	£80

* Classes not in use

Annex 9

Broadcasting calculations and valuations

Analogue valuation

A9.1 Indepen's valuation of the analogue TV spectrum has been based on identifying the block of 4 frequency channels that serve the least households and the net costs of serving those households by Digital Satellite. The value of the spectrum was calculated as £1m per MHz per year. This translates to £368m per year for the 46 x 8MHz frequency channels used to provide the five analogue TV channels. The table below gives an overview of how these results were derived from the assumptions above.

Overview of opportunity cost calculation for analogue

Marginal change	1 group of 4 frequency channels is assumed to be unavailable
Number of households that lose analogue coverage	1,740,000
Proportion of households already using digital	30%
Net number of households that would lose TV coverage	1,300,000
Equivalent annual cost of providing satellite/cable TV per household (first TV set only) ³³	£24.80
Total cost of installing TV sets	£32.2 million
Annual saving in transmitter cost	£1 million
Opportunity cost for four frequency channels per year	£31.2 million
Marginal change in spectrum	32 MHz (4 x 8 MHz channels)
Opportunity cost per MHz per year	£1 million
Total analogue TV spectrum	368 MHz (46 x 8 MHz channels)
Total opportunity cost for analogue TV spectrum per year	£368 million

A9.2 Indepen's valuation should be viewed as indicative because of the number of simplifying assumptions that Indepen had to make. Moreover Indepen's estimates make no allowance for the loss of reception for second and third sets in each household, which would tend to lead to an increase in the values of the spectrum overall and have a compound effect on the overall cost of digital switchover.

Digital valuation

A9.3 The Indepen forecast valuation of digital TV spectrum *after switchover* is based on the cost of providing digital satellite services to the households which would lose DTT coverage if the number of frequency channels per PSB MUX were reduced from 6 to 5 (net of any saving in the transmission costs). This has been calculated at £1.2m per MHz per year. This equates to £57.6m

³³ Indepen assumed the installation and equipment cost for satellite/cable was annualised over ten years.

for 1 digital multiplex assuming 6 x 8MHz channels or £9.6m per TV channel assuming 6 TV channels per digital multiplex. The table below gives an overview of how these results were derived from the assumptions made by Indepen.

Overview of opportunity cost calculation for digital broadcasting post switchover

Marginal change	1 frequency channel from each of the two PSB multiplexes is assumed to be unavailable
Reduction in coverage for a five channel vs. six channel multiplex	5% (95%-90%)
Number of households with TVs in the UK	25,700,000
Number of households that lose digital terrestrial coverage	1,285,000
Proportion of households using satellite or cable at switchover	35%
Net number of households that would lose TV coverage	845,000
Equivalent annual cost of providing satellite/cable TV per household (first TV set only)	£24.80
Total cost of installing TV sets	£20.95 million
Annual saving in transmitter cost	£1.765 million
Opportunity cost of the 2 frequency channels per year	£19.2 million
Marginal change in spectrum	16 MHz (2 x 8 MHz channels)
Opportunity cost per MHz per year	£1.2 million
Spectrum for a PSB multiplex	48 MHz (6 x 8 MHz channels)
Opportunity cost per PSB multiplex per year	£57.6 million
Total digital TV spectrum post switchover	256 MHz (32 x 8 MHz channels)
Total opportunity cost for digital TV spectrum per year	£307 million

A9.4 Indepen's valuation should be taken as indicative because of the number of forward looking and simplifying assumptions they had to make. Moreover, as for the analogue TV spectrum valuation, Indepen's estimates make no allowance for the loss of reception for second and third sets in each household.

Benefits

A9.5 An indication of the benefits of migration to digital transmission is provided by estimating the cost of providing national coverage for the five analogue channels using either analogue or digital technology.

- With analogue, 46 frequency channels are required at 8MHz per channel to carry the first four TV channels, with an opportunity cost of £368 million per annum.
- With digital technology likely to use around 32 frequency channels at 8MHz per channel for the 5 Public Service TV Broadcasting Channels, plus 30 or so commercial channels, at an approximate opportunity cost of £307 million per annum. This is £61 million less per annum than the cost of analogue, but many more channels can be carried.

A9.6 If just the 5 PSB channels were carried on digital technology, 2 multiplexes would be likely to be used. These would require 12 frequency channels at 8MHz per channel with an approximate opportunity cost of £115 million per annum. This is £253 million less per annum than the cost of carrying the 5 PSB channels on analogue

Summary of Indepen Opportunity Costs and Indicative Prices, Opportunity Costs for Spectrum – (Indicative Price)

	Opportunity Cost per MHz per year	Total MHz in use	Total opportunity cost	MHz per Mux	Opportunity cost per Mux
Analogue pre-DSO	£1m	368	£368 million	N/A	N/A
Digital post-DSO	£1.2m	256	£307 million	48 ³⁴	£58 million

A9.7 The actual prices to be paid for the spectrum by individual broadcasters would be based on the % of the spectrum used.

Further work by Ofcom

A9.8 Since the publication of the Indepen study in February, Ofcom has continued to work on the analysis and develop the ideas it contained. We continue to work on permutations of the opportunity cost valuation and its application to TV broadcasting.

A9.9 Thus far, Ofcom has proceeded on the basis of estimating the cost of providing the five analogue terrestrial television services digitally. Again this has been based on the least cost alternative for installation and coverage and has determined a valuation for the analogue spectrum based on cost savings from switching off analogue transmitters region by region and the cost of connecting households which lose TV service to DTT.

A9.10 The results of this analysis can be summarised as follows:

- valuation if all TV sets in households which lose analogue service are connected to DTT
 - £465m for the analogue spectrum as a whole i.e. 46 x 8MHz channels
- valuation if only connect first TV set to DTT in households which lose analogue service (this is the basis that Indepen did their calculation on)
 - £135m for the analogue spectrum as a whole i.e. 46 x 8MHz channels

³⁴ Indepen assumed that a PSB multiplex would use six frequency channels post switchover.

Overview of Ofcom updated opportunity cost calculation for analogue broadcasting

Marginal change	Analogue TV channels are switched off region by region
Number of households covered by analogue TV	24,700,000
Number of households who would lose analogue coverage (all regions) ³⁵	11,000,000
Additional TV sets in households that lose analogue coverage	26,200,000
Equivalent annual cost of providing replacement DTT service per TV set ³⁶	£9.60
Total cost of installing DTT first TV sets	£105 million
Total cost of installing DTT additional TV sets	£250 million
Saving in annual transmission costs by moving to from analogue to DTT	£25 million
Opportunity cost of analogue TV spectrum per year (assuming all sets converted per household)	£330 million
Opportunity cost of analogue TV spectrum per year (assuming one set per household converted)	£80 million

A9.11 There are several differences between Ofcom's adaptation of the Indepen work and the original. The most significant changes are, firstly households which lose analogue service are reconnected using DTT rather than digital satellite as assumed by Indepen. The cost of providing DTT receivers is about half that for digital satellite (including the Solus card), therefore this reduces opportunity cost. Secondly Ofcom has taken into account the cost of reconnecting all TV sets in a household, not just the first set as calculated by Indepen. This change pushes the opportunity cost estimate back upwards.

A9.12 Ofcom will continue to develop and refine the Indepen opportunity cost analysis for spectrum pricing and study in more detail the issues surrounding its application to TV Broadcast spectrum.

³⁵ Digital penetration was 55.4% for June 2004 as reported in Ofcom's Digital Television Update.

³⁶ We assumed the cost of a DTT set top box is annualised over five years (i.e. it would be replaced ever five years). Ofcom believes five years is a more realistic estimate of the lifetime of set top boxes than the ten years assumed by Indepen.

Annex 10

Glossary

2G

Second generation of mobile telephony systems using digital encoding. 2G networks support voice, limited data communications, and different levels of encryption. 2G networks worldwide include TDMA and CDMA, with GSM used in the UK.

3G

Third generation of mobile telephony systems, providing high-speed data transmissions and supporting multimedia applications such as full-motion video, video conferencing and Internet access.

AIP

Administered Incentive Pricing or spectrum pricing: fees charged for access to spectrum to reflect its value. AIP applies in bands for which significant demand exists for that spectrum either in its current use, or for an alternative radio service, and acts as an incentive to users to use their spectrum as efficiently as possible.

AES

Aircraft Earth Station

Allocation

a) The process of identifying specific frequency ranges for specific applications; or
b) a frequency band entered in a table of frequency allocations, for use by a particular category of services.

Analogue switch-off

Process of moving all TV households from analogue to digital terrestrial television reception and so releasing spectrum used for analogue television transmission for other uses.

Assignment

Authorisation given by a licensing authority for a radio station to use a specific radio frequency or channel under specified conditions.

Authorisation Directive

Directive 2002/20/EC of the European Parliament and of the Council of 7 March 2002 on the authorisation of electronic communications networks and services, available at:

http://europa.eu.int/eur-lex/pri/en/oj/dat/2002/l_108/l_10820020424en00210032.pdf

Band

A defined range of frequencies that may be allocated for a particular radio service, or shared between radio services.

Base station

A radio transmitter and receiver installed by an operator, usually at a specific location, to provide a communications service, typically used in mobile telecommunications.

Broadcasting Acts

The Broadcasting Act 1990 and the Broadcasting Act 1996 (amended by the Communications Act 2003). These Acts govern the licensing and operation of the broadcasting industry (including the provision of cable TV services, but excluding the BBC) in the UK.

CAA Civil Aviation Authority

A public corporation established by Parliament in 1972 as an independent specialist aviation regulator and provider of air traffic services.

Cave Review

Review of Radio Spectrum Management, by Professor Martin Cave, published March 2002, available at:

<http://www.ofcom.org.uk/static/archive/ra/spectrum-review/index.htm>

CCTV

Closed-Circuit Television

Common Base Stations (CBS)

a) A base station for PBR shared by users (also known as a community repeater); or
b) a PBR installation giving wide area coverage under the control of one or more operators offering mobile communications on a commercial basis to a number of independent (usually business) users.

Communications Act

Communications Act 2003, which received Royal Assent on the 17th of July 2003.

CSR-UK

Coastal Station Radio; maritime business radio which uses a UK only allocation in the channels (157 – 163 MHz).

Data Networks

A network established and operated for the specific purpose of providing data transmission services for the public.

DRL

Digital Replacement Licences; the licences which will be granted under the Communications Act 2003 to replace the Broadcasting Act Licences.

DSO

Digital Switch Over; the process of facilitating the switching off of analogue transmission for broadcasting across the UK and the transfer of broadcasting to digital multiplexes.

DSO Plan

The plan to switch off analogue transmission across the UK on a region by region basis, to be defined by DCMS, DTI, Ofcom, the broadcasters, and the transmission companies, NTL and Crown Castle.

DTT

Digital Terrestrial Television

Earth station

Centre for communicating by radio with a space satellite.

EIRP

Equivalent Isotropically Radiated Power; a theoretical measure of the power of a transmitter that radiates equally in all directions.

Emissions

Electromagnetic energy propagated from a source, which may occur anywhere in the spectrum.

Fixed Links

Communications links between fixed points. Such links may be unidirectional or bidirectional, and may be point-to-point or point-to-multipoint.

Framework Directive

Directive 2002/21/EC of the European Parliament and of the Council of 7 March 2002 on a common regulatory framework for electronic communications networks and services, available at:

http://www.oftel.gov.uk/ind_info/eu_directive/s/framework.pdf

Frequency Boundaries

The extremities of the radio frequency range of an assignment, specified either in terms of a central frequency with channel width, or a frequency range.

Frequency Re-Use

Re-using the same frequencies at different spatial locations, in such a manner that the frequencies are arranged so that they do not cause undue interference to one another.

FSS

Fixed Satellite Services

FWA

Fixed Wireless Access: radio link to the home or the office from a cell site or base station, replacing the traditional local loop.

GSM

Global System for Mobile communications; the international operating standard for 2G.

Guard band

Frequency range between assignments to protect users on either side from out-of-band interference.

Indepen report

An update of NERA and Smith's original spectrum valuation work, commissioned by the Radiocommunications Agency to Indepen, Aegis and Warwick Business School. The report was published on the Ofcom website on 2 March at:

www.ofcom.org.uk/research/industry_market_research/m_i_index/spectrum_research/independent

Interference

The effect of unwanted signals upon the reception of a wanted signal in a radio system, resulting in degradation of performance, misinterpretation or loss of information compared with that which would have been received in the absence of the unwanted signal.

ITV

Commercial television network consisting of 16 Independent Television Licensees, licensed under the Broadcasting Act to provide public broadcast services.

JFMG

JFMG Ltd undertakes licensing of programme-making and special events spectrum on behalf of Ofcom, administering licences and collecting licence fees.

Liberalisation

Process by which licensees may request amendments to existing restrictions or conditions in their licences to permit change of use or reconfiguration of rights to use spectrum.

Licence class

Type of licence issued by Ofcom, for example PAMR. Volume classes refer to those licence classes for which there are significant numbers of licensees, for example on site PBR with 26,000 licensees.

Licence exempt

Some types of radio equipment are exempted from the requirement for a licence. The installation of such equipment is not a criminal offence, provided that the terms of the regulations are complied with. The current regulations are the Wireless Telegraphy (Exemption) Regulations 2003 (SI 2003 No. 74), available at: <http://www.legislation.hmso.gov.uk/si/si2003/20030074.htm>

Marginal Value

The additional value gained from using one more unit of an input or producing one more unit of output. Typically the marginal value declines as the amount of the input of good increases.

MASTS

Mobile Assignment Technical System, an electronic assignment system currently under development for Ofcom.

MCA

Maritime and Coastguard Agency. Regulatory of maritime and coastguard agency services.

Mobile Satellite

A service between mobile earth stations and one or more space stations, possibly including feeder links in operation.

MoD

Ministry of Defence.

Multiplex

A method of sending and receiving multiple signals over a communication channel without loss of information.

Ofcom

Office of Communications. Ofcom has taken over the RA's responsibility for spectrum management in the UK in December 2003.

Oftel

Office of Telecommunications, which was the telecommunications regulator, until its functions transferred to Ofcom on 29th December 2003.

Opportunity cost

The potential value of an asset is the next best alternative that is foregone by virtue of its actual use.

PAMR

Public Access Mobile Radio.

Partitioning of licences

In a spectrum trading market, licence holders may transfer only a part of the rights and obligations associated with their spectrum licence - whereby the licence can be divided (e.g. partitioned) by geography, frequency and by time.

PBR

Private Business Radio (previously known as Private Mobile Radio (PMR)). A private radio service installed and operated by businesses and public sector organisations to provide mobile communications for their own workforces.

PMR

Private Mobile Radio, see PBR.

Point-to-multipoint

Fixed link having at one end a multi-directional antenna for communication with multiple users over or relatively small area.

Primary Assignment

The initial allocation of spectrum by the regulator to the market.

Propagation

The transmission of radio waves. Propagation characteristics depend on frequency and are affected by the environmental conditions, such as terrain and atmospheric conditions, encountered on the path.

PSB

Public Service Broadcasting/Broadcaster.

RA

The Radiocommunications Agency: a former executive agency of the Department of Trade and Industry, which was responsible for the management of most non-military spectrum in the UK and for representing the UK in relevant international bodies. The RA ceased to exist when its functions transferred to Ofcom in December 2003.

RSA

Recognised Spectrum Access.

RSL

Restricted radio services transmission licence.

Safety of life services

Services provided by organisations who use radio spectrum to protect the lives of individuals, such as the emergency services.

Scanning Telemetry

National channels that are licensed to the water, electricity and gas companies.

Spectrum

A continuous range of frequencies of electromagnetic radiation (for example, radio waves).

Spectrum tariff unit

An average tariff per MHz of spectrum used.

Spectrum trading

Process through which spectrum licence holders are able to transfer some or all of their rights to a third party.

Telemetry

The transmission of data by radio for remotely indicating or recording measurements.

TETRA

Trans European Trunked Radio Access: An ETSI standard for mobile radio, utilised by fleets of vehicles.

Transmission companies

Crown Castle (now part of NGC) and ntl.

UHF

Ultra High Frequency; electromagnetic spectrum between 300 MHz and 3 GHz.

UMTS

Universal Mobile Telecommunications System – a third generation mobile standard.

Undue interference

Interference with any wireless telegraphy that is harmful, as provided by section 183 Communications Act 2003. This includes interference that creates dangers or risks of dangers to the functioning of any radiocommunications service designed for the purposes of navigation or safety services, or if the interference degrades, obstructs or repeatedly interrupts authorised broadcasting or other wireless telegraphy.

VHF

Very High Frequency; electromagnetic spectrum between 30 and 300 MHz.

VSAT

Very Small Aperture Terminal.

Wireless microphones

Equipment used by programme-makers and organisers of special events.

WT Acts

Wireless Telegraphy Act 1949 (as amended by the Wireless Telegraphy Act 1967) and Wireless Telegraphy Act 1998. These Acts are further amended by the Communications Act 2003. WT Acts regulate the use of civil radio spectrum in the UK.

WT Act licences

Licences issued under section 1 of the Wireless Telegraphy Act 1949 (as amended).