Spectrum Management and Broadcasting: Current Issues

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Abstract: Broadcasting policy has traditionally been supported by a 'command-and-control' system of assigning frequencies for terrestrial transmission, but this link is being eroded by the emergence of other technologies – cable, satellite, IPTV, mobile broadcasting - and by the emergence of multi-channel television, which is facilitated by digital terrestrial television. The switch off of analogue terrestrial transmission is being achieved through significant government intervention, but with diverse intentions relating to the use of the freed spectrum. It is argued, however, that the trend to liberalise spectrum policy is strong, and that this will promote the liberalisation of broadcasting.
Key words: : spectrum management; broadcasting policy; digital switchover

Historically, broadcasting relied exclusively on spectrum, which fell under the control of public agencies, and was itself in Europe particularly heavily controlled by governments, through public ownership of broadcasters, limitation on entry and supervision of content [1]. Before the explosion of spectrum-using technologies of the last 20 years, shortage of frequencies often acted as an alibi used to stop the development of new services, usually with the enthusiastic support of existing broadcasters.

That era is now decisively ended, through the interaction of several simultaneous changes.

- New convergent platforms are now in place that deliver broadcasts using a range of technologies: analogue and digital terrestrial, satellite, cable and ADSL using telecommunications companies' copper wires; the latter two

[1] This paper will focus on video entertainment (i.e. TV) although a discussion of audio (i.e. radio) would have similar features, except that it would be writ smaller (and later). That is to say, close control of radio via regulation and command and control spectrum policy survived the advent of television. As with digital television radio is now expanding, according to competitive standards, but discussion of a radio 'digital switchover' is much less well advanced.

do not use frequencies in the conventional sense (although their emissions can cause interference problems).

- The variety of services has exploded from the handful available twenty years age to a multi-channel world that supports itself not only through government or licence-fee payments and advertising (the old methods), but also through pay services; moreover, viewers can buy services 'on demand' and avoid advertising material through personal video recorders.

- The growth of mobile or, more generally, wireless communications has demonstrated the value of the spectrum for which those services compete with broadcasting; this has created pressures to switch terrestrial broadcasting from analogue to digital technologies, which are about five times more efficient in their spectrum use. In the longer term, it may lead to the abandonment of terrestrial broadcasting completely, in favour of wire-based networks and satellite distribution, which uses less valuable spectrum and is less expensive over wide areas.

This article traces the interaction between spectrum management and these factors, firstly by reviewing spectrum management techniques applied to broadcasting, and then developments in transmission technology, especially digital switchover.

■ Spectrum management and broadcasting: past and present

Public policy in the field of spectrum allocation has exercised a powerful influence on broadcasting. Governments used their power to assign spectrum as an auxiliary instrument for controlling the number and identity of broadcasters. Traditional spectrum management techniques suited this purpose very well.

These techniques are known as 'command and control' and have operated in essentially the same way since the first global convention for co-ordinating spectrum use in 1906. Under the system, spectrum blocks are allocated through international agreement (global or regional) to broadly defined services. National spectrum regulatory authorities (traditionally government departments, now increasingly independent agencies) subsequently assign licences for use of specific frequencies within these allocations within their jurisdictions (CAVE, 2002, p. 55).

This regulatory task involved an inherently complex balancing act in a range of dimensions, in each of which there are many conflicting considerations. Key factors included:

Interference

Transmissions interfere with one another unless sufficiently separated in terms of frequency, geography and time. Regulators must strike a balance between reducing the extent of harmful interference, through careful planning, and enabling new and potentially valuable new services to enter the market.

International co-ordination

The effective use of radio spectrum in one country will typically require careful co-ordination with neighbouring countries, to mitigate the extent of harmful interference.

Investment in equipment

Most radio equipment can operate over only a limited range of frequencies, and so relies on predictable access over time to defined frequency bands. Stability in spectrum assignments to encourage investment in equipment can slow the place of spectrum re-use. Increasingly, technical specifications are agreed internationally to reap economies of scale in production. Spectrum regulators need to balance stability and international harmonisation with responsiveness to new technologies.

The problems of co-ordinating broadcasting spectrum are particularly severe, since broadcasting is a 'one-to-many' communications technology, which is efficiently done with high power over a large area. This inevitably creates the risk of interference with broadcasters in neighbouring areas or countries. This problem was vividly exposed in the United States in the 1920s when a Court ruling denied the Government the power to control access to spectrum. The resulting free-for-all, in which radio stations progressively turned up their power to resist interference from others, led to a 'Tower of Babel' and eventually to the Radio Act 1927, which gave the Secretary of Commerce power to authorise and control access to spectrum.

The resulting problems are resolved in the age of television broadcasting by international agreements, which set out in great detail which transmission at what power are permissible from which specified sites. Thus analogue

terrestrial television broadcasting in Europe is governed by agreements reached in Stockholm in 1961. An equivalent plan for digital television broadcasting in currently being developed for approval at a Regional Radio Conference (RRC) in Geneva in 2006.

Subject to these constraints, each national spectrum authority assigns frequencies to particular broadcasters. In the United Kingdom, for example, analogue and digital terrestrial TV transmissions currently use 368 MHz of spectrum within the band 470-854 MHz. The spectrum is split into 46 frequency channels, each composed of 8 MHz of spectrum. The following bands are used:

- 470 to 590 MHz (channels 21 to 35),
- 598 to 606 MHz (channel 37),
- 614 to 854 MHz (channels 39 to 68).

(To complicate matters, channel 36 is allocated to radar for historical reasons.) Each channel can be used to broadcast either one analogue TV service, or one digital multiplex – carrying six or more separate TV services – from a given transmission site. There is a maximum of 11 channels used at a transmission site (five for analogue TV channels, and six for DTT multiplexes). At such sites there are still seemingly 35 frequencies (46 minus 11) lying idle. These empty frequencies are interleaved with the frequencies used for the analogue and digital services. Some of the empty interleaved frequencies channels cannot be used because they would cause interference with the channels that are used or with adjacent transmitters; some, however, could be made available to broadcasters or other users.

Satellite broadcasting also requires spectrum for two purposes – to uplift signals to the satellites and to broadcast signals direct to home (DTH). As signal strength from the medium-powered satellites currently in use if fairly low, frequencies must be cleared of alternative services to allow signals to 'get through'. A further feature of satellite broadcasting is that, because transponders have a multinational footprint, and because uplift and reception can be in different countries, the spectrum authority in the country where the signal is received may have no jurisdiction over the provider of transmission services.

While command and control has been used almost universally for managing broadcasting frequencies as well as others, attention has turned in several countries to the alternative of using market mechanisms to allocate and assign spectrum. A start has been made in this process with the use of auctions to assign licences, especially for third generation mobile

services, but the market agenda extends to 'secondary trading,' namely the exchange of ownership of spectrum or spectrum licences that have already been issued, accompanied by the opportunity for the existing or new licence to change the use of the spectrum – often known as liberalisation, subject, of course, to international obligations. The U.S. and UK spectrum management agencies have supported, and to some degree introduced, secondary trading and liberalisation (FCC, 2002; Ofcom, 2005a). The European Commission recently proposed that all spectrum used for terrestrial broadcasting and fixed and mobile wireless communications should be tradable and flexible. (EC, 2005a). This is being realised particularly through a policy known as WAPECS (wireless access policy for electronic communications services, a Commission Communication on which is expected in mid 2006 (RSPG, 2006).

The implications of this policy (which currently has, at best, minority support from the member states) would be major. It would mean that a substantial swathe of frequencies would be available for a range of possible uses. As well as mobile telephony, these include mobile broadcasting and wireless broadband, both 'broadcasting' technologies providing 'broadcasting' services, but in a non-traditional form.

Mobile broadcasting has had several trials in Europe and elsewhere, but fully fledged commercial services are still in their infancy [2]. Given the small screen high levels of definition are not required, so that, roughly speaking, the spectrum for one terrestrial channel can transmit three services. It is not known yet which frequencies are best suited for mobile broadcasting, across a range which, in the UK, includes spectrum used for digital audio broadcasting (in which BT, Microsoft and others are developing a wholesale mobile broadcasting service), the so-called L-band at 1452-1492 MHz (which the UK spectrum regulator, Ofcom proposes to auction in 2007), and spectrum freed by the analogue broadcasting switchoff described below. A similar range of technological opportunities applies in other countries.

The European Commissioner for the Information Society and Broadcasting has noted the development of plans for mobile broadcasting in a number of countries and suggested that action might be needed to make reception available within the EU as a whole (REDING, 2006). However, the discussion above suggests that it may be premature to seek either to

[2] The European Radio Spectrum Policy Group (RSPG) is preparing an opinion for the European Commission on spectrum for mobile multimedia services in the field of broadcasting. The RSPG is a group of national spectrum regulators that advises the Commission.

standardise the technology or to harmonise spectrum allocations for mobile broadcasting.

Wireless communications technologies such as 3G (developed to higher speeds via HDSPA), fixed CDMA and Wi-Max are also capable of downloading or streaming broadcasts to individual (mobile or fixed) customers. This point-to-point technology is inherently more expensive than point-to-multi-point broadcasting technologies, but services are now or will soon be available.

In the face of these competing claims on spectrum should spectrum regulators (government departments on independent agencies) adopt an administrative or command and control approach, or should they allow the market to decide via auctioning of spectrum among competing users and uses, and secondary trading with flexible use? The Commission's proposals are set out above. But the UK has already opted for a predominantly market-based regime.

As in other countries, in the UK broadcasting policy generally drove spectrum allocation rather than *vice versa*. Channels were added as and when broadcasting policy dictated, despite the availability of extra spectrum. The emergence of digital terrestrial transmission has been highly directed process. The only significant departure was the 'unauthorised' emergence in 1988 of direct to home (DTH) broadcaster Sky, which used a Luxembourg-based satellite and did not initially require a broadcasting licence from the regulator or a wireless telegraphy licence from the UK Government. But following the merger with its 'approved' rival BSB, BSkyB too came into the regulatory fold.

Highly detailed planning of broadcasting frequencies was undertaken by the broadcasters themselves or their regulators. This has led to what is recognised as efficient outcomes, in the sense that the spectrum was used intensively, but complaints abounded over its distribution among different broadcasters. The regime also lacked any mechanism as to how to deal with issues of the assignment of more spectrum, except with traditional means [3].

[3] Market mechanisms had been used previously in the UK to allocate commercial broadcast licences via a competitive tendering process. The object competed for was not a spectrum licence alone, but a package involving both favoured access to viewers and the availability of spectrum, conditional to the performance of specified public service broadcasting obligations. Thus a 'bundle' was auctioned; as a result the value of the spectrum license alone was not transparent.

Following the explicit legalisation of spectrum trading in the European Union in 2003 under the new regulatory arrangements, the UK Communications Act of 2003 placed on Ofcom, the newly integrated (broadcasting and telecommunications) regulator, the duty of seeking optimal use of spectrum, and laid the basis for the introduction of secondary trading and change of use of spectrum, in addition to the auctions of spectrum already used for primary issues. Prior legislation had also permitted the spectrum agency to levy an annual payment for spectrum use on private or public bodies, which became known as an 'administered incentive price'. This was notionally designed to represent the value of the spectrum in an alternative use – its 'opportunity cost' – and to encourage economy and efficiency in spectrum use (Ofcom, 2005d). Public service broadcasters in particular continue to oppose what they call a 'spectrum tax'.

Ofcom quickly developed a Spectrum Strategy Framework (Ofcom, 2005a) and Implementation Plan (Ofcom, 2005b), together with a series of measures to accommodate trading. The strategy envisaged a speedy switch from 'command and control' to market methods, which by 2010 would account for 70% of assigned spectrum (see table 1), another 4-10% being licence exempt [4].

Table 1 - Use of different spectrum management techniques

a) Spectrum below 3GHz			
	Command & Control	The Market	Licence Exempt
1995	95.8%	0.0%	4.2%
2000	95.8%	0.0%	4.2%
2005	68.8%	27.1%	4.2%
2010	22.1%	73.7%	4.2%
b) Spectrum between 3GHz and 60GHz			
	Command & Control	The Market	Licence Exempt
1995	95.6%	0.0%	4.4%
2000	95.3%	0.0%	4.7%
2005	30.68%	61.3%	8.2%
2010	21.1%	69.3%	9.6%

Source: Ofcom (2005a) p. 36

The UK is clearly an extreme case, where tradability of spectrum will extend to public sector uses (such as additional spectrum required for the emergency services) in the future. Other administrations may nevertheless

[4] Licence exempt spectrum can be used by anyone abiding by power restrictions. Wi-fi 'hot spots' are a good example of current licence exempt use. Due to the interference problems noted above, licence exempt spectrum is not suitable for wide area broadcasting.

find it increasingly difficult to arbitrate not between competing firms producing the same service, but between competing users providing quite different services. The trend of spectrum management more generally is likely to favour market methods. This is now discussed in relation to the transition from analogue to digital terrestrial broadcasting.

■ Digital switchover

The key spectrum issue facing broadcasters in 2006 involves proposals to switch off analogue transmission and move to digital technologies. Each of terrestrial, satellite and cable transmission modes can be realised in both analogue and digital formats, but in the latter two cases, the technological choice resides almost exclusively with the platform owner. However, because analogue terrestrial has been responsible for the universal service delivery of television to viewers without access to other platforms, the switch to digital terrestrial transmission has been the product of a complicated interaction of public policy, regulation and commercial incentives. As well as expanded capacity, digital transmission offers other advantages such as much greater interactivity.

Table 2 - Digital TV penetration rates (% of households) in a number of countries, end 2005

	Total	*Cable*	*Satellite*	*DTT*	*IPTV(*)*
UK	68.9	10.5	32.0	25.2	0.2
France	34.7	4.3	21.6	6.9	1.9
Germany	28.9	6.7	17.8	4.2	0.1
Italy	36.0	0.0	20.2	14.9	0.9
Netherlands	11.4	5.3	3.1	2.3	0.6
Poland	17.9	0.4	17.5	0.0	0.0
Spain	27.6	5.6	15.4	5.2	1.5
Sweden	44.5	9.6	20.6	13.3	1.0
USA	50.3	25.3	24.2	0.5	0.3
Japan	59.1	7.2	33.1	17.9	0.9

(*) Delivered by DSL or equivalent technology

Source: Screen Digest

This particular form of digital switchover (or digital transition or analogue switchoff) is occurring or planned all over the world. Thus Japan has set a switch-over date of 2011. Legislation has recently been passed in the U.S.

requiring analogue switch-off on 17 February 2009 [5]. Some data on the penetration rates of digital TV in a number of countries are given in table 2.

In Europe, the European Union has adopted a target date of 2012 and a final date of 2015 for completion of the switchoff on analogue terrestrial, but member states have in many cases adopted more exacting targets (see table 3).

Table 3 - European digital switchover timetables for terrestrial transmission

Country	*Target Date*	*Other details*
Austria	2010	
Belgium	2012	
Cyprus	no date set	
Czech Republic	2017	
Denmark	2011	No decision yet
Estonia	2012	
Finland	2007	Aug 07 – all of country
France	2010	
Germany	2008	Berlin switched off 2003.
Greece	2010	
Hungary	2012	
Ireland	no date	No decision yet
Italy	2006	
Latvia	2006	
Lithuania	2012	SO starting in 2012
Luxembourg	no date set	Market to decide
Netherlands	no date set	No decision yet
Malta	no date set	
Poland	2014	
Portugal	2010	No decision yet
Slovakia	2012	
Slovenia	2015	2012 target
Spain	2010	May start earlier by region
Sweden	2008	In progress
United Kingdom	2008-2012	Region-by-region

Source: European Union May 2005, partially updated April 2006

Germany achieved the first regional switchover in 2003, in Berlin, a heavily-cabled area. In mid 2006 switchover was half completed and the target date of 2010 seems attainable. France has now set 2010 as the switchover date. Italy has now delayed the switch-over target to 31 December 2006, but this is quite impracticable. Finland has a completion date of August 2007, and Sweden of 2008, with a 50% target by the end of 2006. Experiences in the UK are discussed below.

[5] For further analysis of developments through the world, see CAVE & NAKAMURA (2006).

One consequence of the switchover to digital terrestrial is that, for a transitional period, both analogue and digital platforms have to be used at once. The length of the period is under government control, but the turnover of customer premises equipment – televisions, VCRs, etc. – of which there may be three or more per household – is a slow process, and provision may have to be made to encourage the acquisition of digital set top boxes by slow adopters. In Italy, which has a switch over target date (almost certainly unrealistic) of the end of 2006, the government is offering set top box subsidies of 40 euros per household, effectively restricted to DTT boxes – which has led to charges of illegal state aid.

Nonetheless, the possible 'spectrum dividend' associated with analogue switch-off has encouraged most governments of richer countries to seek a digital switchover of terrestrial transmission, which both brings the advantages of digital television (more channels, interactivity) and releases valuable spectrum that can be assigned to other users, either by command and control or market methods [6].

But some obstacles have to be overcome before alternative uses can be implemented. In particular, the Geneva RRC of May/June 2006 (or a subsequent authorised meeting) must agree that released spectrum can be used for other purposes than broadcasting. If such alternative uses are authorized, it will be on the footing that this may not cause more interference than broadcasting, and would receive no more protection from interference than broadcasting.

The European Commission has solicited from an opinion on the EU spectrum policy implications of the digital dividend the Radio Spectrum Policy Group (RSPG) [7]. This follows its May 2005 Communication, which sets out the Community policy objectives for the transition and notes that it is important not to unduly constrain the re-use of the freed bands for new and innovative services (EC, 2005b).

Debate in the UK has been particularly intense as a result of the legislative obligation in the Communications Act 2003 to ensure that digital coverage will replicate that attained by analogue transmission, and by the conflicting interests of broadcasters, many of whom, including the pay

6 Some estimates of the value of free spectrum in Europe can be found in HAZLETT *et al* (2006).

7 See footnote 2.

satellite broadcaster BSkyB and analogue channels that currently face competition in respect of some households only from four other analogue channels, are likely to be adversely affected by DTT. The UK had also achieved the highest levels of digital penetration in Europe by mid-2006 (over 70%), especially of DTT in the form of Freeview, comprising of forty channels, largely non-pay. This favourable background for a switch-over followed a lengthy debate, which began in September 1999 when the UK government first announced its ambition to switch off the analogue TV signal and move to digital transmission. It said that the digital switchover could start as early as 2006 and finish by 2010, although the precise date would depend on the behaviour of broadcasters, manufacturers and consumers.

The government also announced that switchover would not take place unless the following conditions were met:

- Everyone who could watch the main public service broadcasting channels in analogue form (i.e. 98.5% of households) could receive them in digital.
- Switching to digital was an affordable option for the vast majority of the population.

The target indicator of affordability was defined as 95% of households having access to digital equipment before switch-over, generally taken to mean that 95% of households would have adopted digital TV before switchover occurred. A plan soon crystallised to carry out the switch-over on a region-by-region basis

The cost of converting receivers was expected to vary according to several factors, including:

- the amount of digital equipment a household already has,
- how much additional equipment the household wishes to continue to use after switchover,
- their platform and equipment choices,
- their service choices,
- prevailing prices in the year(s) they make their purchases.

However, as the switch-over will not be voluntary for some people and, for most, affordability will be a major issue, there must be some minimum, one-off cost with which consumers feel comfortable. The cost of conversion for a house with only one TV where a new aerial is not required is estimated at EUR 60-110, while the cost for a house with two TVs and one VCR may be as high as EUR 110-220.

In research commissioned by the government, most households without digital TV said they were likely to convert of their own accord within the next few years. However, this left some 20% of households who currently intend to remain analogue only. Independently of whether they could receive a DTT signal, three-quarters of this group said they would adopt digital if they knew switch-over was imminent, while the remaining quarter (5% of all households) said they would never be willing to convert.

The group least willing to convert to digital TV was not a coherent cluster with clearly defined socio-economic or demographic characteristics. Instead it tended to have a variety of reasons for remaining with analogue TV. A household's propensity to adopt digital television frequently reflected its attitudes towards TV and multichannel TV in particular. Consumers least willing to adopt digital television tended not to value TV as a medium, or alternatively felt that more TV channels would have a negative impact on society. Some others believed that digital TV had little to offer over and above the analogue TV offering; while some mentioned issues such as cost and difficulty of use.

In accordance with normal practice, the UK Government presented a justification of the switchover policy in the form of a cost-benefit analysis (DTI, 2005). The analysis evaluates the costs and benefits to the UK of completing a digital switchover involving the switch-off of all analogue signals. This scenario is compared with continuing both the analogue and digital transmissions. The analysis focuses on the quantifiable effects of switchover, including environmental effects. The non-quantifiable effects of switchover such as the public service aspects of the DTV project are not discussed and the distributional aspects of the project are not examined in detail.

The consumer costs of switchover include the net cost of set conversion, which will be achieved by purchasing a set top box (STB). However, the aggregate cost of purchasing STBs overestimates the economic cost of switchover, as some of these consumers will have been very close to buying into digital, even if the switchover were not to take place, i.e. they value digital TV at some level between the cost of the STB and zero. To model this, it has been assumed that the implicit demand curve for STBs is a straight line from the cost of as STB to zero, and therefore the average valuation by consumers is half the cost of the STB.

One of the key consumer benefits associated with switchover is the value of increased DTT coverage to previously un-served areas, areas that it was

impossible to reach using digital signals during dual transmission. Consumers will also benefit from the release of fourteen channels of clear spectrum when analogue transmission ceases. The economic value of this extra spectrum depends on the use to which it is put: generally it is estimated that it will be of more value if it is used for mobile telecommunications rather than television. However, because of risks and uncertainties associated with the use of using spectrum for mobile telecoms, the cost-benefit analysis is based on the assumption that the released spectrum is used for digital television services.

The key producer benefit from switchover is the cost saving from decommissioning analogue transmitters, as the cost of running, maintaining and fuelling such sites will no longer have to be borne. It is assumed that any producer surplus arising for the operators of the new services on released spectrum will be competed away.

The cost-benefit analysis shows quantifiable benefits in the region of £1.1 – £2.25 billion in net present value (NPV) terms [8]. Sensitivity analysis gives results that are reduced under some assumptions, but remaining substantially positive under most likely combinations of assumptions. The model shows that the outcome in terms of NPV is most sensitive to estimates of the value of extended coverage of DTT services and released spectrum.

The UK government has taken on a commitment to ensure a level of coverage of public service broadcast signals equivalent to that currently available with analogue broadcasting. However, this could be achieved by various means: by directly mandating public service broadcasters to transmit in particular ways, or indirectly by placing enforceable burden on relevant broadcasters to meet a specified availability target, in whatever way they chose; the latter approach would contemplate the possibility of a variety of technologies being employed to provide coverage - DTT, cable, satellite, DSL and other technologies. Broadcasters with a universal coverage obligation would have an incentive to seek out the cheapest combination from a commercial standpoint. Such harnessing of incentives has clear advantages. Moreover, any preference for a single platform inspired by

8 The NPV is the capital sum available today which is equivalent to the expected stream of net benefits.

regulator or government would, if accompanied by explicit or implicit state subsidies, raise issues of possible state aid [9].

Following a lengthy consultation, Ofcom finally decided to mandate DTT as the means of providing universal digital coverage for public service broadcasting multiplexes, although commercial multiplexes were free to make their own choices, so long as coverage did not decrease (Ofcom, 2005c). Even this prescriptive solution left open a number of trade-offs among the objectives of a) coverage (raising the level by small amounts) above the current 98.5% available using digital technologies, b) power levels (which determine the number of channels available or a particular multiplex), c) the cost of additional transmitters, and d) the risk that the option adopted would be subject to delays. The variant that emerged victorious in 2005 was one which allowed more channels to be broadcast by using a particular mode of operation (known as 64QAM).

This means that, as digital switch over progressively occurs throughout the UK regions, analogue transmitters will fall silent at each of the current 1154 sites. All of those sites will be used for DTT, in place of the 80 sites currently used, at lower power, to achieve a 70% coverage. The UK would thus effectively replicate its existing analogue networks, but with a six-fold increase in capacity.

This leaves open the question of how the liberated spectrum will be used. Ofcom has established a digital dividend review (DDR) review to investigate stake-holders' views and to establish a methodology for valuing alternative applications. Its starting point is that auctioning the spectrum for flexible use is the most likely way forward, but other considerations could override this. UK broadcasters, however, would prefer an allocation of the freed spectrum to them, which would support two or more national digital multiplexes in addition to the six already in operation. Proposals have been put forward to use the additional spectrum for high definition television (HDTV), which requires approximately four times as much spectrum as normal definition broadcasts. As a result of these requirements, the released spectrum would support only a handful of HDTV services, and it seems more efficient to provide such services using the less expensive spectrum utilised by satellite broadcasting, or by cable or DSL.

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[9] This is a particular danger following the Altmark case, in which the European Court specified a need for competitive tendering to be used where possible to finance projects with public subsidies. Note that the Commission concluded that the switch-over accomplished in Berlin involved state aid, because of its lack of technological neutrality.

The UK debates are of particular interest because the government and regulator have both sought to bring out both the economic effects of switch-over and been faced with the problem of replicating existing high analogue coverage levels. The degree of legal constraint on use of the spectrum has been low, although this partly depends on decisions made at the 2006 Regional Radio Conference in Geneva.

In other member states, the spectrum regulator's freedom of manoeuvre is much lower. This applies, for example, in France and Germany, where legislative or political commitments to maintaining broadcasting use have been much stronger than in the UK.

■ Conclusion

The broadcasting sector is thus on a transition path from the old world, in which command and control allocation of spectrum and state control of broadcasting combined to supply a very limited range of non-competitive services, to one in which multiple wireless and wire-based platform supply competitive services - free to air and pay - delivered in traditional linear or non-linear fashion.

Spectrum policy can either promote or delay these changes. In the UK, a liberalised spectrum policy is likely to permit new broadcasting services, fixed or mobile, to come to the market, provided they can outbid other users for the spectrum. In other countries, spectrum policy associated with switchover is tending to exclude competition with alternative uses. Within this framework, the spectrum regulator, in combination with the broadcasting regulator, can either promote new broadcasting competition, or assign released spectrum to existing broadcasters, of either the commercial or public service variety. Unfortunately, the political economy of broadcasting regulation is such that released spectrum is often given to incumbents, which typically have great political influence.

This may not be enough, however, to sustain the broadcasting status quo. The momentum behind new services such as mobile broadcasting is very strong. Other frequencies spectrum released as part of the digital dividend can provide them. IPTV is becoming established, using DSL. Even conservative spectrum regulation will struggle to turn back the tide of new broadcasting services.

References

CAVE M. & K. NAKAMURA (2006): *Digital Broadcasting: Policy and Practice in the Americas, Europe and Japan*, Edward Elgar, Cheltenham.

CAVE M. (2002): Review of Radio Spectrum Management, London; HM Treasury and DTI.

DTI (2005): *Cost-Benefit Analysis of Digital Switchover*, Department of Trade and Industry.

EC:

- (2005a): Communications: a market-based approach to spectrum management in the European Union.
- (2005b): *Communication in Accelerating the transition from analogue to digital broadcasting* COM (2005) 204

FCC (2002): *Spectrum Policy Task Force Report*

HAZLETT T.W. *et al* (2006): 'The social value of TV band spectrum in European countries', INFO 8:2 pp. 67-73.

Ofcom:

- (2005a): *Spectrum Strategy Framework*
- (2005b): *Spectrum Strategy Framework: Implementation Plan – Interim Statement*
- (2005c): *Planning options for digital switchover: statement*
- (2005d): *Spectrum Pricing*
- (2006): *Digital Dividend Review*

REDING V. (2006): *Television is going mobile – and needs a pan of European policy approach*, Speech 06/15