

FURTHER RESPONSE **BY CHANNEL 4 TELEVISION** **TO THE INDEPENDENT REVIEW OF** **RADIO SPECTRUM MANAGEMENT**

Channel 4's major concerns about the proposals set out in the Consultation Paper issued by the Independent Review of Spectrum Management were set out in the paper we submitted to the Review in July. We have also been able to put forward our views in meetings with the Review team.

Although Channel 4 is grateful to have had these opportunities to present its views to the Review team, we remain concerned that the Review fails to address a number of our concerns as well as wider issues related to public service broadcasting.

In this paper, we wish to follow up our previous arguments and re-state our main concerns.

CHANNEL 4'S MAIN CONCERNS

1. Making efficient use of spectrum

The underlying rationale of the Review's argument is that introducing price mechanisms will lead to more efficient use of spectrum. Like other respondents to the review, we remain to be convinced that significant inefficiencies exist in broadcasters' existing use of spectrum, or that the Review team have demonstrated their existence.

Exponents of introducing price mechanisms argue that it is only by establishing a market in spectrum that inefficiencies will be identified. But this argument cannot of itself be sufficient reason for introducing a far-reaching reform – there has to be some demonstration (a) that the current system contains inefficiencies, and (b) that a market system would lead to improvements.

The present system of spectrum allocation and planning for broadcasting is complex and dependent on co-operation and co-ordination between the terrestrial broadcasters. The ways in which the transmission system works in practice is set out in a paper from Channel 4's Chief Engineer attached as an appendix to this submission. That paper shows that available spectrum is already being used to broadcast the four main analogue networks and that in the last few years available space in the spectrum planning model has been used to identify the frequencies used to broadcast first Channel 5 and subsequently the six digital networks.

Channel 4 does not believe there are significant inefficiencies in the present system, and believes the existence of inefficiencies would need to be demonstrated before there is any move to a radically different system.

2. Who would pay for Channel 4's use of spectrum?

Professor Cave has suggested that the introduction of 'administrative pricing' could lead to Channel 4 being levied a fee of "something in the region of the low tens of millions of pounds" per annum. If Channel 4 had to find this money from its own resources, it would inevitably mean taking money away from other uses, including programming. A spectrum payment of £40m a year would be the equivalent of about 10% of Channel 4's programme budget. To make Channel 4 pay for its spectrum would amount to a tax on its viewers.

Channel 4 delivers a wide range of public service programmes including, last year, 1,000 hours of education at a cost of £61.6 millions; 552 hours of news and current affairs at a cost of £36.8 millions; and 231 hours of multicultural programmes at a cost of £11.4 millions. In addition, the Channel last year invested £30 million in film production as an explicit part of its remit and some £10 million in external training and talent development. In addition to such direct public service obligations, the channel has a core remit to be innovative and distinctive – qualities whose value is easy to recognise but much harder to quantify. The overall 'public service' delivered by Channel 4 is not readily susceptible to being priced, although its value is self-evidently several times the amount of the putative spectrum levy.

3. Does paying Channel 4 to buy its spectrum provide incentives?

The Review's Consultation Paper sets out a procedure for the BBC to be provided with the funds to pay for its own spectrum and then suggests "many of these mechanisms could also be applied to Channel 4". But, unlike the BBC, Channel 4 receives no public money and has no wish to do so. To be in direct receipt of state aid, even for the express purpose of paying state levies, could fundamentally compromise the independence and status of the channel.

The Review team has argued that charging Channel 4 for use of its analogue spectrum "could have a positive role to play in encouraging Channel 4 to switch from analogue to digital broadcasting". As a national public service broadcaster obliged to transmit to the whole of the UK¹, Channel 4 will only be able to stop analogue broadcasting when the government has decided that analogue switchoff is feasible. No amount of "incentivising" of Channel 4 will enable us to switch off our analogue signal before co-ordinated, government-led action by the regulator and all the terrestrial broadcasters.

DIGITAL SWITCHOVER

Channel 4 wholeheartedly agrees with the Review Consultation Paper's view that "moving from analogue to digital terrestrial broadcasting" will make "a major step-change improvement in spectrum efficiency". That is unquestionably the most effective single step towards increased efficiency of spectrum use.

¹ "Channel 4 shall be provided by the Corporation under a licence granted to them by the Commission, and shall be provided for so much of England, Scotland and Northern Ireland as may from time to time be reasonably practicable" (Broadcasting Act 1990, s24 (3))

However, the crucial question is how to achieve digital switchover in a way that guarantees continuity of broadcasting to the vast majority of the British population. This question cannot be answered by any one broadcaster. It is at heart a political question that the government began to answer two years ago by setting out its three criteria of access, availability and affordability as the pre-requisites for full switchover. More recently, the publication in draft of the government's Digital Action Plan has set out a series of tasks that need to be undertaken by government, regulators and the whole of the television industry (broadcasters, manufacturers and retailers) in the next few years in order to get close to meeting the three criteria and thereby achieving switchover.

Channel 4 has already invested heavily in digital television. Together with ITV we have built and run the Digital 3 and 4 network to provide digital terrestrial services. This investment costs £10 million a year, in addition to the £22 million cost of analogue transmission. At the request of the government², Channel 4 is also investing in new digital services. We have launched new high profile digital channels E4 and FilmFour with success and acclaim. We have promoted them heavily and they have contributed significantly to the take up of digital television. Our joint venture horse-racing channel Attheraces will follow next year. We are currently set to invest some £169m³ in our non-simulcast digital channels over a seven-year period.

In our response to the draft Digital Action Plan, Channel 4 stressed the importance of clarity and stability in the years ahead to provide the confidence needed for continued investment in the digital future. We argued that early decisions about the technical means by which switchover would take place and about settling payment for the second 12 year period of the Digital 3 and 4 licence at zero would help provide that stability. Proposals to change radically the spectrum management regime would detract from rather than contribute to the stability we seek.

CONCLUSIONS

Channel 4 does not believe that a wholesale change in the spectrum management regime for broadcasting will produce significant improvements in efficiency. The Review's determination to establish an "over-arching principle ...that all spectrum users should face some price reflecting the opportunity cost of their spectrum use" could lead to a mechanism with obvious drawbacks but no obvious gains. If there is a time when a market in spectrum makes sense it is likely to occur at the moment of analogue switch-off when, unless the government decides to allocate spectrum for specific nominated services, significant bandwidth will be released for new purposes.

² Chris Smith wrote to the ITC chairman on 28 July 1997 "I know you very much share my aim that in using the capacity allocated to them on that [Digital 3 & 4] multiplex, Channels 3 and 4 provide worthwhile new programming choices for viewers".

³ £66m in FilmFour, £80m in E4 and £23m in Attheraces over a seven year period.

The Review team has argued that introducing spectrum pricing will lead to transparency and that for a value for spectrum to appear in the annual reports of broadcasters such as the BBC and Channel 4 will make clear the opportunity cost of the spectrum they use. But this exercise only has real value if broadcasters have a choice over whether to use that spectrum; as we have argued above, they do not. It may be of academic interest to know the cost of the extra spectrum needed to broadcast to the Outer Hebrides – but until someone suggests that inhabitants of those islands should as a matter of policy cease to receive television broadcasts it remains an academic exercise.

Channel 4 has already invested heavily in both its analogue and its digital transmitter networks. This has been done on the understanding that we would not be charged for our use of the spectrum, because of our public service programming and our contribution to the roll-out of digital. We believe it would be both destabilising and a revocation of these arrangements if we were required to pay for spectrum. We recognise that there may be merit in using an auction or other price-based mechanism when allocating the spectrum released by analogue switch off (even if the spectrum is to be used for broadcasting). But because such an approach may be appropriate for new users, it does not follow that it should be introduced for incumbents who have already invested heavily in launching the digital age.

Channel 4 Television

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APPENDIX: Engineering Context and Considerations

1. Current Spectrum Use in Television

a. Analogue Broadcast.

The strategic planning of UHF spectrum that led to the 1961 Stockholm plan has served the commercial and non-commercial development of UK television broadcasting well. On the basis of this plan, the UK now has:

- Two non-commercial BBC channels serving 99.4% of the UK population
- Two commercial public service TV channels (Channels 3 and 4, including S4C in Wales) serving 99.4% of the UK population
- One national commercial TV channel (Channel 5) with some public service attributes serving around 80% of the UK population
- Thirteen new local TV channels ("Restricted Services") either recently launched or shortly to be launched

UK television services are broadcast only in bands 4 and 5

Band 4 occupies that part of the spectrum ranging from 470 MHz to 590MHz, which contains 15 TV channels - 21 to 35 inc. - each of 8MHz. In the UK, each 8MHz channel incorporates the vision signal which itself incorporates both picture information and Teletext data services including closed subtitles, and both mono f.m. and stereo NICAM audio.

TV channel 36 is reserved for use by airport 50cm. radar installations, and channels 37 and to a lesser extent 38 for radio astronomy. These three channels occupy 590MHz to 614MHz.

Band 5 occupies that part of the spectrum between 614 MHz and 854 MHz, and contains 30 TV channels, 39 to 68 inc., each of 8MHz. The channel structure used in the UK is common for the whole of Europe, indeed because of frequency planning considerations and the need to reduce interference between neighbouring countries television services, the frequency plan for Europe must also consider North Africa and parts of Asia.

There are 1126 common u.h.f. analogue transmitter sites in the UK, of which Channel 4 utilises 912. The remainder are used by S4C, who provide the fourth channel in Wales, or are non-standard stations where C4 is not transmitted.

For frequency planning reasons, the four main analogue broadcasters have been allocated 'standard groupings' of TV channels for use at individual transmitter sites. This is to ensure that any one site's transmissions do not interfere with those of another adjacent or nearby site. These groups are located spectrally throughout bands 4 and 5. As a result of this grouping, all available TV channels are used by the four main broadcasters, but each individual broadcaster will mainly use those channels allocated to it in each of the standard groupings. For example, channel 51 is not used at all by Channel 4, but is used at 106 sites by BBC1. The same situation obtains for any two broadcasters.

All transmitter sites transmit all four major services - with a few exceptions - which are all transmitted with the same power using the same mast/tower, again with a couple of exceptions.

Between them, the four main broadcasters use all the channels in bands 4 and 5 many times over. The actual usage of a particular channel depends to a large extent on the power with which it is transmitted from a particular site, and consequently the distance from that site where another use of that channel for another signal would be impossible due to interference. The power of transmissions vary tremendously; our lowest transmission power is 1 watt, (S4C, ITV and the BBC have an even lower one at 0.1 watt in Wales), and our largest is 1 million Watts (we have three of those). It should be noted that as the tv signal is a 'standard' the highest power transmitter uses the same amount of spectrum as the lowest, so a repeater serving a small area with around 1000 people will use the same spectrum as Crystal Palace serving several million people. The geographical coverage may be different but the bandwidth is identical.

It can be seen therefore that if the utilisation of a particular channel were displayed graphically on a map of the UK, there would be an array of non-overlapping circles of widely varying radii, in a selection of up to 4 colours, each colour relating to a particular broadcaster.

For actual channel utilisation, each site would have to have a weighting factor applied, which related to the geographical area it covers. This is only broadly related to transmitted power, as topographical features play a large part in determining coverage.

Analogue coverage (for the four main channels) is well over 99% of the population of the UK.

Latterly, Channel 5 transmissions have been incorporated into the gaps of channel usage; coverage can be patchy, particularly in the South of England where international co-ordination has been difficult.

b. Digital Broadcast.

Because digital terrestrial TV requires a much lower signal strength in order for a TV to receive a satisfactory signal (typically -10dB), DTT can be transmitted in the 'gaps' between the coverage circles mentioned above, whilst not using any other frequency bands (i.e. bands 4 & 5), than those already allocated to the UK. International co-ordination of this new usage was achieved and issued following a CEPT (European Conference of Postal and Telecommunications Administrations) meeting for this purpose held in Chester (UK) in 1997. This system utilises the inefficiencies of the original coverage model, which, when it was derived, took no account of a future requirement to interleave a second terrestrial set of 6 networks amongst the original 4 analogue networks. Not to mention Channel 5!

At the time of writing, there are 80 DTT transmitter sites, all co-sited with existing analogue transmitters. In some cases, some of the networks transmit on more than one channel. The planners model states that about 82% of the UK population has satisfactory coverage of free-to-air services. This coverage is very variable and there is strong evidence of STB's being returned because of coverage issues. These may be as a result of signal strength variation or because of old analogue aerial installations. Currently there is a trial being undertaken to assess the effect of small increases of transmitted power at selected sites with a view to further increasing the reliability of DTT transmissions.

Currently available statistics indicate that Digital take-up is :-

Sky (DSAT)	5.3 million households
NTL cable	1 million households
Telewest cable	0.56 million households
ITV Digital (DTT)	1.1 million households

About eight million homes view a digital platform; about one third of all homes. The majority of these homes receive their digital service via a separate Set Top Box (STB), although the popularity of integrated digital receivers (iDTV's) is growing for the reception of DTT services.

By March this year, well over 3 million widescreen sets have been sold in UK, half of which were in the last year. 13% of UK homes have widescreen TV – sales in the UK are greater than France and Germany combined. All the UK major broadcasters are originating 85% of peaktime output in Widescreen format.

120,000 iDTVs had been sold by the end of 2000, 93,000 of those in the year 2000. If that rate of increase continues, then maybe 150k sets sold in 2001? These sets will receive the Free to Air services as delivered, if subscription services are also required then there is a possibility of installing a conditional access module into the set. In the near future the possibility of using a plug in card in a consumer p.c. will give availability of DTT off air services to the home (currently free to air only).

2. Our Transmission Contracts

The transmission of the Channel 4 analogue service is carried out on our behalf by NTL. The contract for this service runs until 31/12/2012.

Transmission of the DTT service is again provided by NTL through a contract with the Multiplex operator Digital 3 & 4. This contract runs for a period of 12 years from the launch date of the service to November 1998.

British Telecom provides distribution of both analogue and digital services to the transmitter network under a joint contract with Digital 3 & 4 and Channel 4. This contract runs for a period of 12 years from 31/10/98.

3. More efficiency in transmission?

The pressure from authority is to achieve more efficiency in the transmission process. The development of the Digital Terrestrial Television service (DTT) is the more efficient replacement for the original analogue PAL service. However it is not perfect – see below, and it uses the same channel spectrum as used previously by the analogue service, albeit to transmit more services. Because of the nature of television broadcasting – a one (or a few) to very many, any change in the transmitted signal must be matched by a change in the receiver characteristics. This is the thrust of the move to DTT, with a marked reluctance of some parts of the population to make the switch. Currently Free To Air DTT channels are available to about 82% of the UK population; however less than 33% have chosen to take the option to receive it. To move to the more efficient DTT system so that ‘95% of consumers have access to digital equipment’ – of which a good proportion will need DTT because of restrictions in receiving DSAT – will require a major uptake of the DT service which has not been seen so far.

4. Picture Quality Issues – is DTT equal to Analogue?

The Digital Terrestrial service is considerably more efficient than that of the analogue service. 6Mhz of *analogue* spectrum carries one broadcast channel or, by means of signal compression, up to six *digital* services. But these are not necessarily equivalent. Popular mythology has it that ‘digital quality is better than analogue’. This is only partially true.

Analogue signals degrade proportionally with distance from the transmitter, or with shielding from geographical features. Thus at the extremes of a transmitter’s service area some viewers will have a noisy signal.

On the other hand *digital* signals continue to provide received signals of equal quality independent of distance from the transmitter, assuming that the reception point is within the service area. However the received digital signal will fail catastrophically once the limit of the service area is reached or a topographical feature attenuates the signal. Practice has also taught that reception of the digital signal can be very sensitive to impulsive interference. Central heating pumps, thermostats etc, all can cause reception problems for the DTT viewer.

The signals carried in the DTT 'multiplex' are compressed. By the very nature of the compression system parts of the signal are discarded to allow the television signal to 'fit' within a smaller 'pipe'. Whilst compression techniques are exceedingly complex and sophisticated, there is degradation relative to the original full bandwidth signal. Part of the compression technique is to reduce the higher frequencies that are transmitted – those representing fine picture detail. Another part of the technique is to reduce re-transmission of elements that do not change much between successive pictures – temporal information. However if the picture has a lot of fine detail and there is a lot of information that changes between successive pictures, then the compression system is stretched and picture artefacts are produced – spurious effects that were not present in the original. The amount of compression that is applied to the television signal can be judged from the fact that whilst an uncompressed signal will require 270 Mbps; a 'mildly compressed' signal around 90Mbps, a 'good quality compressed' signal about 50Mbps, a 'news quality' signal about 25Mbps: the DTT service delivers signals at around 4Mbps.

Careful observation of received signals by an untrained observer can, on occasions, detect these degradations as a result of compression. However at present these are not particularly apparent to the general public.

However this is changing. Until recently television viewers used the received analogue signal as the yardstick by which picture 'quality' could be judged. The only other source of pictures was the VHS recorder which gave a poor quality imitation of the original broadcast signal. Recently there are other sources of television pictures in the home that are capable of giving better quality than the received DTT picture. DVD players, home *digital* camcorders are both capable of giving improved quality.

In addition there are a number of new display devices which accentuate the differences between transmitted broadcast signals and other sources. Plasma screen displays are now coming into domestic use, and early next year DLP projection devices will become available as domestic displays. As well as displaying 'off air' tv pictures they will also interface to the home pc which can have complex graphics generators. Also consumer digital still cameras are also capable of very high quality results.

Informal tests carried out by the EBU in Turin in Autumn 2000 on the differences between a variety of different sources on plasma and CRT displays showed clearly that there are future issue for broadcasters in the area of perceived picture quality as these flat panel displays become more common. Both analogue PAL and low bandwidth MPEG signals (as the DTT service) were 'poor' in comparison to movie sourced DVD signals or non compressed 'studio' signals. Because of the characteristics of the plasma display any artefacts or signal weaknesses are more noticeable on a plasma display than a CRT one. Whilst these tests were not vigorous they do indicate the problems that may exist in future. The broadcast signal will go from 'yardstick' to third or fourth in the quality ladder.

The important point to note is whilst that the compression *technique* used by the DVD disc is similar to that used in DTT the one major difference is that the bandwidth used in a DVD is at least double that used by the DTT system. This to address the issue of perceived quality of the received signal will require *less efficiency* of spectrum use than currently proposed for the DTT services. This is an economic factor, to charge even more for spectrum will make the choice of 'more services of lower quality' even more set in stone.

5. Conclusions

Spectrum usage by television broadcasters is as efficient as the current European spectrum plan will allow. The move to shut down the analogue services will remove duplication of services on analogue and digital – necessary during the transitory phase. However the transmission methods mean that there may well be quality issues for the future, all digital world.

If the shut down of the analogue service results in significant loss of spectrum to broadcasters then a real concern for the future is how future, new, technologies will be exploited. The DTT service was only possible because there was sufficient 'elbow room' in the existing spectrum map, alongside the analogue services to allow the start of transmissions of the DTT service.